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Inflation in DoD Medical Care

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PREFACE

This paper was prepared by the Institute for Defense Analyses (IDA) for the Director, Program Analysis and Evaluation, under a task entitled "Estimation of Medical-Specific Inflation Indices." This work completes that task by evaluating the inflation indices used to construct the Defense Health Program and estimating factors for medical intensity and technology.

This work was reviewed within IDA by Philip M. Lurie, Karen W. Tyson, and James A. Lee (an IDA consultant).

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I. INTRODUCTION

The Defense Health Program (DHP) is appropriated funds to provide medical care to active-duty military personnel and their family members, military retirees and their family members, and other eligible beneficiaries. The DHP was established in FY 1993 to consolidate funding that had previously been decentralized across the three Services.

The DHP is divided into four funding categories that we describe in detail in Chapter II:

- Category 1, Military Medical Support;
- Category 2A, Military Medical Unique Functions;
- Category 2B, Education and Training; and
- Category 3, Capitated Medical Care.

In particular, Category 3 includes Military Personnel (MilPers) and Operations and Maintenance (O&M) appropriations for direct care provided at Military Treatment Facilities (MTFs). Category 3 also includes O&M appropriations for purchased care. In FY 1996, Category 3 was funded at a level of $11 billion, or 75% of the DHP total of $15.5 billion.

The Category 3 funding requirement is updated annually to account for changes in the following set of factors:

- number of users of military health care,
- age and sex distribution of military health-care users,
- foreign exchange rates,
- utilization management,
- programmatic adjustments,
- inflation, and
- intensity and technology (I&T).

Definitions of these factors and techniques for measuring them are discussed in Chapter II. The final two factors have proven problematic in the past. A variety of indices are used to inflate the DHP budget requirement. The Director of Program

Analysis and Evaluation (PA&E) tasked the Institute for Defense Analyses (IDA) to assess the appropriateness of these indices and to propose alternatives if the current indices are judged unsatisfactory. In addition, although the DHP methodology contains a placeholder for I&T, the value zero has always been used absent a credible factor for military health care. The Director of PA&E also tasked IDA to develop such an I&T factor.

A. INFLATION

The Consumer Price Index (CPI) subindex for medical care (CPI–M) is used to inflate just over one-half of the base O&M funding. The CPI–M is not necessarily the most appropriate index for the portions of the DHP to which it is currently applied. Moreover, the CPI has recently been criticized even within the context for which it was developed, namely, consumer out-of-pocket expenses in the civilian economy. We discuss the strengths and weaknesses of this and other civilian-sector indices in Chapter III.

We provide additional detail in Chapter IV regarding the indices that are used to prepare the annual DHP budget justification. We propose alternative indices that are theoretically more appropriate than the indices currently used to inflate certain portions of the DHP. We also estimate the impact on the DHP budget if the alternative indices had been applied rather than the actual indices in fiscal year (FY) 1995 and again in FY 1996. In addition, we discuss modifications that could be made to the alternative indices (e.g., reweighting of the underlying subindices) to enhance their applicability to the DHP.

B. INTENSITY AND TECHNOLOGY

The concepts of intensity and technology are designed to capture the number, nature, and, ultimately, the cost of intermediate services provided during a typical hospital stay. In practice, data limitations and diverse methodologies have precluded convergence to a standard operational measure of intensity or technology in the civilian literature. We review this literature in Chapter V, and assess its implications for the DHP.

Our own concept of I&T is the historical funding growth over and above the inflation, demographic, and other adjustments already applied under current DHP methodology. We describe our estimation techniques and report our findings in Chapter VI. Although existing data systems permit a detailed analysis of inpatient direct care, a parallel analysis of outpatient direct care is not yet possible. Therefore, we

extrapolate our inpatient estimates to the outpatient sector using some empirical evidence from civilian hospitals. To capture all of the program elements that we believe will increase in response to I&T, we also develop the base to which the I&T estimates should be applied.

It has been suggested that the CPI–M already, albeit implicitly, contains a factor for I&T. By this argument, I&T would be double-counted if a separate I&T factor were applied to portions of the DHP that are already inflated by the CPI–M. To allay this concern, we will demonstrate that the portions of the DHP for which we believe the CPI–M is appropriate are essentially disjoint from the portions to which we recommend applying an I&T factor. Thus, adopting both our recommended inflation indices and our recommended I&T factor should not result in any double-counting.

II. BACKGROUND

II. BACKGROUND

A. THE MILITARY HEALTH SERVICES SYSTEM

The Military Health Services System (MHSS) provides health care to active-duty military personnel and their family members, as well as retired military personnel, survivors, and their eligible family members. The MHSS encompasses both direct care, provided at Military Treatment Facilities, and purchased care. The latter category includes the Civilian Health and Medical Program of the Uniformed Services (CHAMPUS), TRICARE Managed-Care Support (MCS) contracts, supplemental care for active-duty personnel, and the Uniformed Services Treatment Facilities (USTFs).

Figure II-1 shows the trend in medical-care funding as a percentage of Department of Defense (DoD) Total Obligational Authority (TOA).[1] Medical-care funding has increased from just under 2% of TOA in FY 1967 to over 6% in FY 1997.

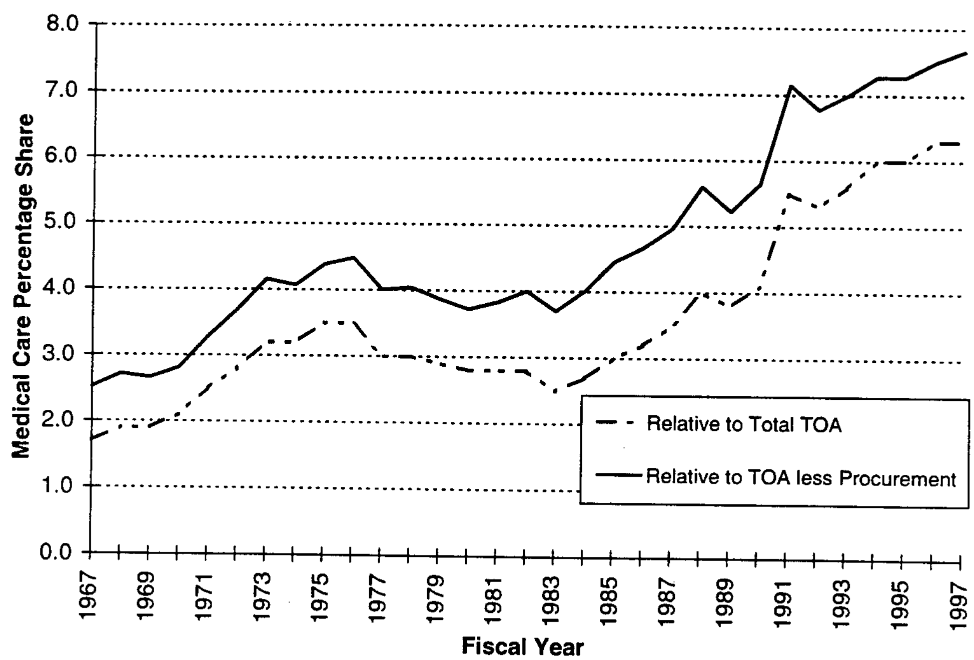

Figure II-1. Percentage Share of Medical Care in DoD TOA, FY 1967–FY 1997

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1 This figure is reproduced from "Defense Health Program: Future Costs Are Likely to Be Greater Than Estimated," GAO/NSIAD-97-83BR, U.S. General Accounting Office, February 1997, p. 26.

The growth in the medical share of the DoD budget may be misleading, however, because much of the decline in the overall budget is due to reductions in weapon-system procurement since the late 1980s. It might be argued that weapon-system procurement does not provide a proper basis of comparison for medical expenditures, because the latter are driven more by the existing force structure than by new procurement. Therefore, we have displayed the medical share not only relative to the total DoD budget, but also relative to the DoD budget less procurement.[2] Even relative to this more stable baseline, the medical share has shown a dramatic increase.

The increase in DoD medical expenditures is sometimes rationalized by analogy with the civilian economy. Figure II-2 compares the CPI for urban consumers, all goods and services (CPI–U) to the subindex for medical care (CPI–M).[3] Between 1987 and 1996, the cumulative increase in the CPI–M was exactly twice that of the CPI–U. Thus, it has been argued, the medical share of the DoD budget must necessarily increase because the DoD medical sector experiences more rapid inflation than DoD as a whole. We will revisit this point in considerable detail below.

B. THE DEFENSE HEALTH PROGRAM CAPITATION MODEL

Before FY 1993, most of the funding for DoD medical care was appropriated directly to the three Services, not to the Office of the Secretary of Defense (OSD). For example, in FY 1991 the OSD appropriations for peacetime medical care were limited to $250 million for the Defense Medical Facilities Office (DMFO) and $150 million for Defense Medical Program Activity (DMPA) (i.e., OSD oversight of the three Services' medical functions). O&M funding began migrating to OSD in FY 1992, including O&M appropriations of $1.14 billion in Program Element (PE) 0807711D (Care in Regional Defense Facilities) and $1.63 billion in PE 0807792 (Station Hospitals and Medical Clinics). The consolidation of funding within OSD was complete by FY 1993, with the establishment of the Defense Health Program.

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2 The procurement appropriations necessary for this calculation are taken from "National Defense Budget Estimates for FY 1998," Department of Defense, Office of the Undersecretary of Defense (Comptroller), March 1997, Table 6-1.

3 The CPI–U is available from the Bureau of Labor Statistics web site, http://stats.bls.gov/cgi-bin/surveymost. The series that we used is the Consumer Price Index–All Urban Consumers, all items, not seasonally adjusted, U.S. city average, Series ID CUUR0000SA0. The CPI–M is available by specifying the Series ID at the following web site: http://stats.bls.gov/cgi-bin/srgate. The series that we used is the Consumer Price Index–All Urban Consumers, *medical care*, not seasonally adjusted, U.S. city average, Series ID CUUR0000SA5.

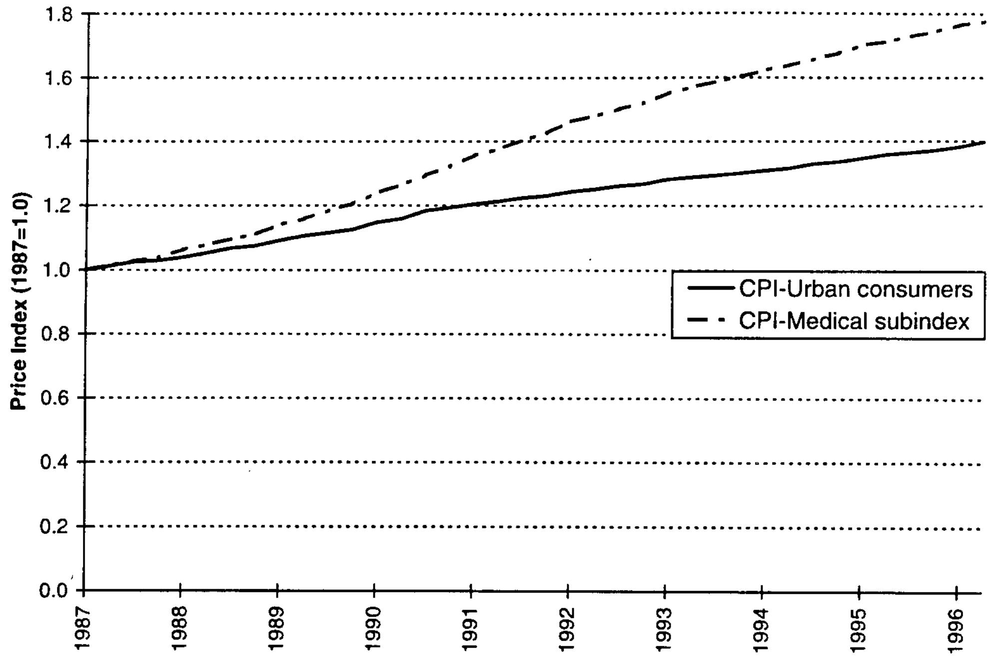

Figure II-2. Comparison Between CPI–Urban Consumers (CPI–U) and CPI–Medical Subindex (CPI–M), 1987–1996

Capitated funding of the DHP was introduced in FY 1994. The DHP is divided into four funding categories. Category 1, Military Medical Support, includes aeromedical evacuation, Medical Entrance Processing Commands (MEPCOMs), environmental compliance, and overseas care. Category 2A, Military Medical Unique Functions, includes readiness planning and exercises, public and occupational health, veterinary services, optical labs, and dental care. Category 2B is Education and Training. Category 3 is Capitated Medical Care.

Category 3 includes both MilPers and O&M appropriations for direct care, as well as O&M appropriations for purchased care. The Category 3 funding requirement is calculated as the product of full-time user equivalents, weighted by relative resource intensity, and an annual capitation rate. The first step in this process is to forecast the raw number of eligible beneficiaries. Active-duty endstrength is estimated from the three Services' Program Objective Memoranda (POMs). Then, the Resource Analysis and Planning System (RAPS) is used to forecast the number of active-duty family members,

as well as the numbers of retired military personnel, survivors, and their eligible family members.[4]

A sample of eligible beneficiaries is surveyed semi-annually to determine the proportion who actually use the direct-care system and CHAMPUS. The survey responses are used to distinguish between full-time MHSS users and those who receive only a fraction of their annual medical care from the MHSS. In particular, a weight of one-eighth is assigned to "MTF-pharmacy-only" beneficiaries, defined as those who meet all of the following criteria:

- they do not receive care at MTFs;
- they may visit civilian physicians, but they pay using either their own funds or private medical insurance, *not* CHAMPUS; and
- they have at least some prescriptions written by civilian physicians but filled at MTF pharmacies.

Having estimated full-time user equivalents, the next step is to apply weights that reflect relative resource intensity by age group and sex. The resource weights currently used in the Capitation Model were estimated in a 1990 study by Bob Gold and Associates, and are reproduced here in Figure II-3. The resource weights were estimated in the following fashion:

> We used two approaches to develop the age/sex factors. First we used expected commercial HMO experience from the Bob Gold and Associates internal data base with several specific adjustments for the CHAMPUS population. These factors are based on a typical civilian population rather than CHAMPUS experience. Second we used CHAMPUS experience for all noncatchment areas, with adjustments for cost sharing and other health insurance. We then adjusted the civilian-based factors to reflect part of the difference between the two sets of factors. We believe the CHAMPUS population, after age/sex adjustments, is significantly different from a typical commercial HMO population. Although CHAMPUS is not in a managed health-care delivery system, CHAMPUS relative age/sex cost experience should still be considered in developing the final age/sex factors. Finally we rebalanced the factors (weighted by population) to composite to 1.00.[5]

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4 "Resource Analysis and Planning System (RAPS) Users Manual," Office of the Assistant Secretary of Defense (Health Affairs), Defense Medical Systems Support Center (DMSSC), May 1994.

5 "CHAMPUS Age/Sex Relative Cost Factors," Bob Gold and Associates, Actuarial Consultants, Chicago, Illinois, May 31, 1990, p. 1.

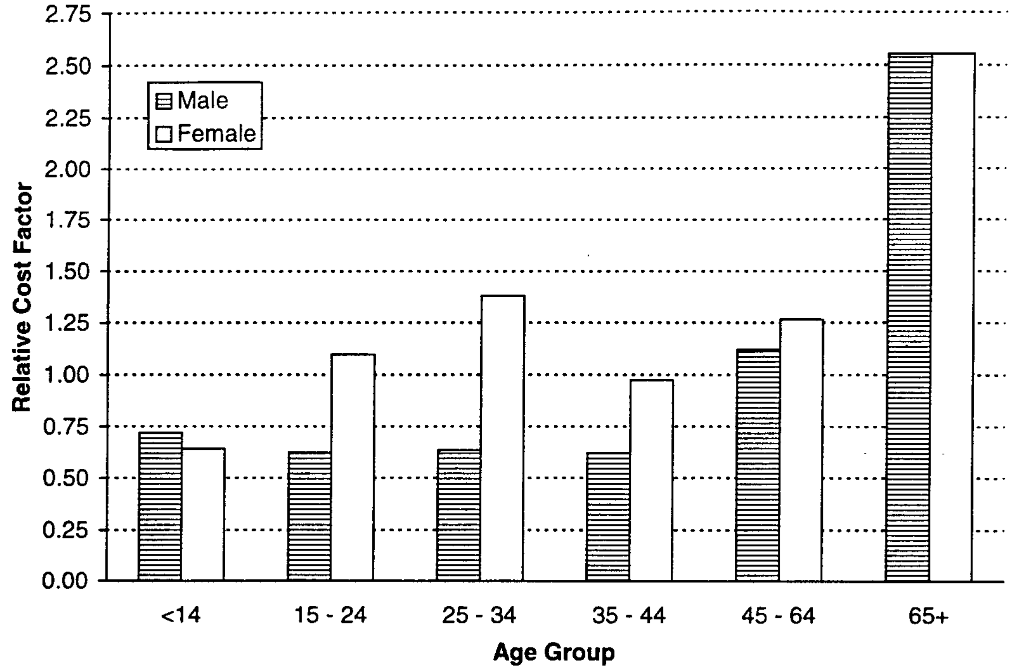

Figure II-3. Age and Sex Factors for Estimating Weighted Users (Source: Bob Gold and Associates, Actuarial Consultants)

Although Gold's resource weights were originally developed for application to CHAMPUS only, in practice they have been applied to all of Category 3 (Capitated Medical Care), including inpatient and outpatient direct care as well as CHAMPUS.

The ratio of weighted to unweighted users provides an index of resource intensity per user. If the resource weights were renormalized every year, the ratio of weighted to unweighted users would always equal exactly 1.0; but because a fixed set of weights is used, the ratio may exhibit a trend. The ratio would increase if, for example, the number of unweighted users remained fixed, but the mix shifted away from low-cost groups (e.g., users age 14 or less) and toward high-cost groups (e.g., users age 65 and above). Moreover, the year-to-year increase in the ratio of weighted to unweighted users may be interpreted as a measure of increasing resource intensity per user. The trend in this measure over the late 1990s is shown in Figure II-4.

In a steady-state, the ratio of weighted to unweighted users would be a constant (not necessarily equal to 1.0, unless the weights were renormalized), and the year-to-year increases in the ratio would be identically zero. The positive year-to-year increases shown in Figure II-4 are a symptom of the aging beneficiary population. However, the generally declining pattern of increases implies that the beneficiary population may be

approaching a steady-state (given current assumptions about out-year endstrength). Note that both the resource weights and the RAPS algorithms were developed prior to the implementation of TRICARE, yet the projections through FY 2003 clearly extend well into the TRICARE period. It would be prudent to revisit the resource weights and the forecasting algorithms once stabilized data from TRICARE become available.

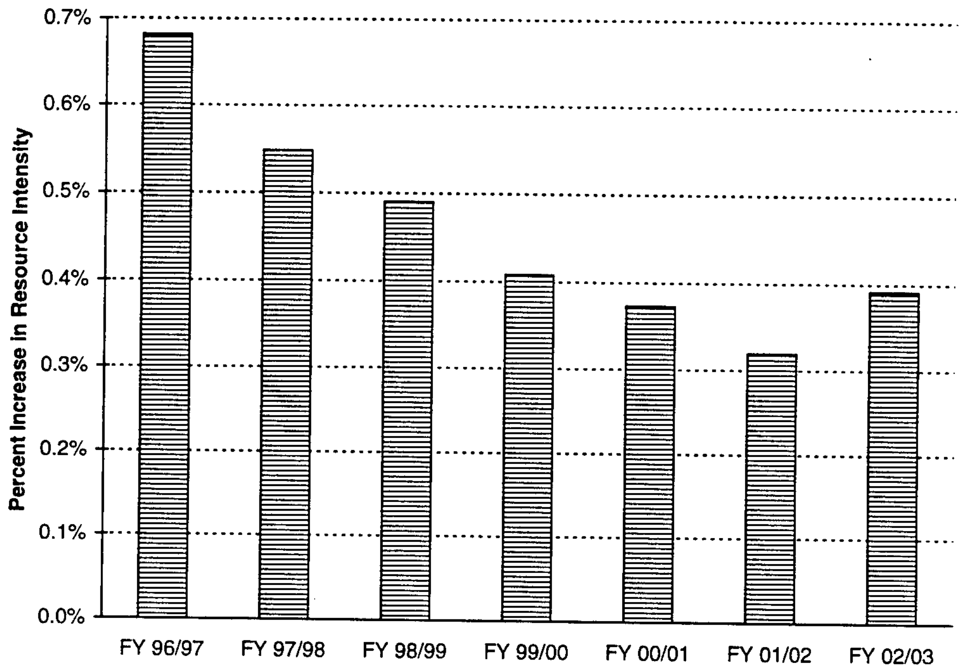

Figure II-4. Year-to-Year Increases in Ratio of Weighted to Unweighted MHSS Full-Time User Equivalents (Source: RAPS Version 10.01 Projections)

The ratio of weighted to unweighted users is applied to proportionally scale the capitation rate for Category 3 of the DHP, and the year-to-year increase in the ratio acts as a uniform percentage increase in total capitated funding (known as the "age/sex adjustment"). To see these points, let $Users_t$ and $Wgt.\ Users_t$ denote the numbers of raw users and weighted users, respectively, in year t. Total capitated funding equals the product of weighted users and the annual capitation rate, and is further proportional to the ratio of weighted to unweighted users:

$$\begin{aligned} Capitated\ Funding_t &= (Wgt.\ Users_t) \times (Capitation\ Rate_t) \\ &= \left(\frac{Wgt.\ Users_t}{Users_t} \right) \times (Users_t) \times (Capitation\ Rate_t). \end{aligned} \tag{1}$$

The year-to-year change in total capitated funding depends upon the corresponding changes in the three terms on the right-hand side of equation (1). To make matters simple, suppose that the number of raw users and the capitation rate remain constant. Then the percentage change in total capitated funding is equal to the percentage change in the user ratio:

$$\left[\frac{\textit{Capitated Funding}_{t+1} - \textit{Capitated Funding}_t}{\textit{Capitated Funding}_t}\right] = \left[\frac{\left(\textit{Wgt. Users}_{t+1}/\textit{Users}_{t+1}\right) - \left(\textit{Wgt. Users}_t/\textit{Users}_t\right)}{\left(\textit{Wgt. Users}_t/\textit{Users}_t\right)}\right]. \quad (2)$$

In practice, the *absolute* change rather than the *percentage* change in the user ratio is applied to scale capitated funding:

$$\left[\frac{\textit{Capitated Funding}_{t+1} - \textit{Capitated Funding}_t}{\textit{Capitated Funding}_t}\right] \cong \left[\left(\textit{Wgt. Users}_{t+1}/\textit{Users}_{t+1}\right) - \left(\textit{Wgt. Users}_t/\textit{Users}_t\right)\right]. \quad (3)$$

This approximation is tolerable because the base value of $\left(\textit{Wgt. Users}_t/\textit{Users}_t\right)$ is nearly 1.0 (the base value for FY 1996 was 1.008). However, substitution of equation (2) for equation (3) would increase the accuracy of the calculation at no additional expense.

There were 6 million weighted users in FY 1996, and the capitation rate was $1,900 per weighted user. Thus, Category 3 of the DHP was funded at a level of $11 billion, which represented 75% of the DHP total funding of $15.5 billion.[6] Of the $11 billion in Category 3 funding, $8.2 billion was in the O&M account. Further, of the $8.2 billion in O&M, some $3.0 billion was spent on direct care.

The Category 3 funding requirement is updated annually by running the Capitation Model with revised inputs. Specifically, updates to the following are made:

- number of full-time user equivalents,
- age/sex adjustment,
- foreign currency adjustment,
- utilization management,
- programmatic adjustments,
- inflation, and
- intensity and technology.

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6 "Capitation Budgeting in the Defense Health Program: Briefing for the 1996 TRICARE Conference," Office of the Assistant Secretary of Defense (Health Affairs), Health Budgets and Programs, January 1996.

The first two updates have already been described. The foreign currency adjustment takes account of variations in exchange rates for goods and services purchased overseas. Utilization management (UM) is a uniform percentage reduction in the funding requirement, reflecting efficiency gains from prospective review, concurrent review, discharge planning, case management, and retrospective review.[7] Programmatic adjustments include studies, programs, and missions added or deleted at the request of Congress.

This paper is concerned solely with the inflation adjustment (discussed in Chapter IV) and the I&T adjustment (discussed in Chapter VI). We will recommend changes to the inflation indices applied to the entire DHP O&M appropriation (a base of $9.8 billion in FY 1996). We will also develop a factor for I&T. The latter factor is applied to a collection of program elements (PEs) for "Direct Care" and "Support" (defined in Chapter VI) that we believe are sensitive to increases in I&T. That base is in one sense broader than the O&M base for the inflation adjustment, including MilPers as well as O&M appropriations; but in another sense it is narrower, encompassing only the specified set of program elements. The net effect of these inclusions and exclusions is that the I&T factor applies to a base of $7.5 billion in FY 1996.

Although the adjustment bases contain considerable overlap, the adjustment *factors* must be kept distinct. We will argue that certain widely used price indices, such as the CPI–M, are upward biased because they already embody I&T as well as pure price inflation. We will recommend alternative indices that are relatively uncontaminated by I&T, thereby avoiding a situation in which the effects of I&T are double-counted. We will also argue that, ideally, the baseline over which I&T are measured should be exactly the inflator (or set of inflators) used to update the program; otherwise, recalibration is required to avoid double-counting.

C. DEFENSE HEALTH PROGRAM PROCUREMENT APPROPRIATIONS

We will attempt to measure I&T using data from the Medical Expense and Performance Reporting System (MEPRS). These data represent operating expenses, funded by the O&M and MilPers appropriations. However, I&T may also be reflected in

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7 Memorandum from the Assistant Secretary of Defense (Health Affairs) to the Secretaries of the Army, Navy, and Air Force, "Utilization Management (UM) Activities in the Direct Care System Under TRICARE," Nov 23, 1994. This memorandum is also available at the OSD (Health Affairs) web site: http://www.ha.osd.mil [accessed May 1, 1997].

the Procurement appropriations. Table II-1 shows the breakdown of Procurement appropriations for FY 1995 through FY 1997. The annual appropriation has averaged roughly $300 million, or only 2% of the total DHP. Of the 3-year total of $885 million, some $260 million, or 30%, was devoted to medical information systems equipment. By contrast, only $170 million, or 20%, was devoted to medical/surgical equipment. Although we will consider the Procurement appropriations in our estimation of I&T, the effects on cost will most likely be found in the O&M and MilPers accounts.

Table II-1. Procurement Appropriations in the Defense Health Program (Thousands of Then-Year Dollars)

	Replacement/Modernization			New Facility Outfitting		
Element of Cost	FY1995	FY1996	FY1997	FY1995	FY1996	FY1997
1. Dental Equipment	1,696	1,480	1,534	197	296	266
2. Food Service, Preventive Medicine, and Pharmacy Equipment	12,119	9,017	10,736	3,835	6,346	402
3. Medical Information Systems Equipment	112,947	87,007	59,532	0	0	0
4. Medical Patient Care Administrative Equipment	46,312	19,058	21,503	1,890	2,839	2,545
5. Medical/Surgical Equipment	41,234	38,223	34,310	14,469	19,487	21,721
6. Other Equipment	8,197	12,571	11,304	3,898	3,646	1,878
7. Pathology/Laboratory Equipment	13,886	12,086	14,018	3,683	6,309	2,410
8. Radiographic Equipment	52,224	42,153	59,969	14,027	24,162	27,342
Total Procurement	288,615	221,595	212,906	41,999	63,085	56,564

Source: "Defense Health Program, Fiscal Year 1997: Justification of O&M Estimates, Data Book," Department of Defense, Office of the Assistant Secretary of Defense (Health Affairs), Exhibit P–22.

III. MEDICAL INFLATION INDICES IN THE CIVILIAN ECONOMY

III. MEDICAL INFLATION INDICES IN THE CIVILIAN ECONOMY

This chapter discusses four general-purpose indices for measuring medical inflation in the civilian economy:

- consumer price subindex for medical care (CPI–M) compiled by the Bureau of Labor Statistics (BLS),
- Health Care Financing Administration (HCFA) hospital input-price index,
- HCFA Medicare Economic Index (MEI), and
- Producer Price Index (PPI) for general medical and surgical hospitals, compiled by the BLS.

In the course of the discussion, we will highlight one additional special-purpose index:

- PPI for surgical and medical instruments and apparatus.

Appendix A presents all civilian and military price indices used throughout this report, for the period 1990–1996. To ease comparisons, we have normalized all indices to the base year of 1990.

A. CONSUMER PRICE SUBINDEX FOR MEDICAL CARE (CPI–M)

The CPI–M reflects payments that employees or consumer units make toward health insurance premiums, as well as out-of-pocket costs including deductibles and copayments. Contributions of employers toward health insurance premiums are treated as income to consumers, not as consumer expenditures, and are therefore excluded from the CPI–M.[1] The CPI–M also excludes health care financed through Medicare Part A, Medicaid, and other entitlement programs, because these are considered government transfer payments rather than consumer expenditures; health care financed through Medicare Part B is included, however, because beneficiaries pay a premium to enroll in

[1] Daniel H. Ginsburg, "Medical Care Services in the Consumer Price Index," *Monthly Labor Review*, August 1978, pp. 35-39.

that program.[2] With these exclusions, medical care receives a weight of only 7.4% in the overall CPI, although its weight in the Gross Domestic Product (GDP) is considerably larger, 16%.[3]

The following factors affect the employees' share of health insurance premiums:

- changes in medical care costs,
- changes in administrative costs and surplus requirements of commercial insurance carriers,
- changes in policy benefits, and
- changes in per-capita utilization.

The first two factors are clearly changes in price rather than changes in either the quantity or quality of insurance, and thus they are included in the CPI–M. The third factor is a change in quality, and is therefore excluded from the CPI–M. Since 1964, changes in utilization have been considered a redefinition of the risk being covered, and these changes are also excluded from the CPI–M.[4]

Some attempts are made to explicitly adjust for quality changes when compiling the CPI–M. However, the BLS concedes that these adjustments are quite imperfect:

> Potentially, some quality changes may be counted as price changes. Items that are not accounted for in the description of the item being priced or that the respondent does not know about, such as hospital room modifications, changes in the number and type of nurses that minister to the patient, or the availability of new equipment, are all likely to contribute to determining the price level of the room service priced; these changes are normally treated as price changes because the Bureau either is not aware of the change or has no method available to deal with the change...Also, improved technologies and procedures can lead to quality changes that cannot necessarily be measured by the Bureau...[There are] examples of improved technologies and procedures that can result in quality changes that are currently hard to identify and adjust for in the CPI. Not only is it

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2 Elaine Cardenas, "The CPI for Hospital Services: Concepts and Procedures," *Monthly Labor Review*, July 1996, pp. 32-42.

3 Michael Boskin et al., "Toward a More Accurate Measure of the Cost of Living," Final Report to the Senate Finance Committee from the Advisory Commission to Study the Consumer Price Index, December 4, 1996, p. 58.

4 "How BLS Measures Price Change for Medical Care Services in the Consumer Price Index," Fact Sheet No. BLS 93-4, U.S. Department of Labor, Bureau of Labor Statistics, July 1993. This memorandum is also available at the following web site: http://stats.bls.gov/cpifact4.htm [accessed April 1, 1997].

difficult to identify the change when it occurs, but at present, no method for assessing the economic value of the change is available.[5]

Before 1985, the CPI–M was based on list prices rather than transaction prices. List prices for hospitals are taken from the hospital's master list of published prices, known as the chargemaster. For professional services, list prices are those charged to "paying" patients (i.e., patients paying their own medical bills, either from their own funds or with the assistance of private medical insurance). Beginning in 1985, the CPI–M has included some alternative fees representing discounts based on the patients' health insurance coverage. More recently, the BLS is attempting to extend the use of transaction prices to hospital rooms, other inpatient hospital services, and outpatient hospital services.[6]

The accuracy of the CPI–M was considered as part of the overall review of the CPI undertaken by the Boskin Commission.[7] The CPI–M reflects three primary categories of goods and services: drugs, professional medical services (i.e., doctors and nurses), and hospitals. Regarding drugs, the Boskin Commission contends that the CPI–M is upward biased because it is too slow to introduce new drugs into the market basket, and because prior to July 1995 it did not treat generic drugs as fully equivalent to name-brand drugs. Only since that date has the introduction of a generic drug been treated as a decline in price; previously, the generic drug and the name-brand drug were considered two distinct commodities. Moreover, late introduction of new drugs into the market basket causes the CPI–M to miss early periods of price *decline*, as production expands and competition among sellers increases. Even with the July 1995 correction, the Boskin Commission estimates that the drug component of CPI–M is biased upward by about 2% per year.

The Boskin Commission contends that the professional medical services and hospital-cost components of CPI–M are upward biased as well. The biases arise because the CPI–M attempts to price only the "inputs" to medical care, not the "outputs" such as increases in life expectancy. For example, a new treatment for heart attacks may cost

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5 Ina Kay Ford and Philip Sturm, "CPI Revision Provides More Accuracy in the Medical Care Services Component," *Monthly Labor Review*, May 1988, p. 24.

6 These issues are discussed by Elaine Cardenas, "The CPI for Hospital Services: Concepts and Procedures," *Monthly Labor Review*, July 1996, pp. 32-42; and "Revision of the CPI Hospital Services Component," *Monthly Labor Review*, December 1996, pp. 40-48. A more critical view is contained in David Dranove, Mark Shanley, and William White, "How Fast Are Hospital Prices Really Rising?" *Medical Care*, Vol. 29, No. 8, August 1991, pp. 690-696.

7 Michael Boskin et al., "Toward a More Accurate Measure of the Cost of Living."

more per patient than the older treatments. However, the new treatment may increase life expectancy by far greater proportion than the increase in cost, so that the cost per additional year of life expectancy actually declines. Yet the CPI–M would ignore the increase in life expectancy and simply record the increase in cost per patient treated. For these reasons, the Boskin Commission estimates that the medical-care components of CPI–M are biased upward by at least 3% per year.

Prescription drugs receive 12.1% of the expenditure weight in computing the CPI–M, whereas professional medical services plus hospital services receive a combined expenditure weight of 78.3%.[8] Even assuming zero bias in the remaining 10% of the CPI–M (representing non-prescription drugs, medical supplies, and health insurance administrative costs and surplus requirements), the weighted average of the Boskin Commission's bias estimates is 2.6% per year.

BLS Commissioner Katharine G. Abraham's response to the Boskin Commission Report is reproduced in Appendix B. In particular, she said the following about the medical portion of the CPI:

> To take another example, I would readily acknowledge that there have been major improvements in the medical treatment available for many serious health problems — improvements that have been of indubitable value to those suffering from the afflictions in question. Unfortunately, as a general matter, the BLS has no good way to measure the value of these improvements. Consider, to take just one example, a hypothetical improvement in knee surgery techniques that gives patients greater mobility following surgery than they previously could have expected. This improved mobility undoubtedly would be of value to those who benefit from the improvement in technique, but there is no obvious or clearly objective way to quantify that value. This is, I believe, an important point about which the Commission and the BLS are in agreement.[9]

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8 Our source is the BLS Consumer Price Index hotline: (202) 606-7000. These were the weights in effect as of December 1996.

9 Testimony of Katharine G. Abraham, Commissioner of Labor Statistics, before the Senate Finance Committee on February 11, 1997. The full text is available at the following web site: http://stats.bls.gov/news.release/cpi.br21197.brief.htm [accessed April 1, 1997].

B. HCFA HOSPITAL INPUT-PRICE INDEX

1. General Features

HCFA maintains a hospital input-price index for use in updating the inpatient payment schedule under Medicare's Prospective Payment System (PPS).[10] The purpose of this index is to separate cost increases over which hospitals have some discretion from those that are beyond their control:

> The hospital input price index provided a means to measure and forecast the part of increased hospital expenditures that was solely the result of price increases in hospital inputs. The hospital input price index established a reasonable and understandable basis from which to begin the process of prospectively setting allowable increases in hospital costs.[11]

The HCFA hospital input-price index covers both labor and non-labor operating costs. It excludes any capital costs associated with building construction or major equipment purchases. Those costs are reimbursed through a separate mechanism, rather than being included in Diagnosis Related Group (DRG) payments under the PPS. The HCFA index also excludes the incremental costs of Graduate Medical Education (GME).

The HCFA index is more relevant than the CPI–M as a benchmark for DoD direct care. The CPI–M measures consumers' out-of-pocket costs, including deductibles and copayments, as well as the consumers' share of health insurance premiums. But the DoD direct-care system is a *producer* of medical care, not a consumer. The HCFA index measures the costs that civilian hospitals incur for the labor and other inputs that they use in producing inpatient medical care. To the extent that these input prices inflate at similar rates in the military and civilian sectors, the HCFA index is more relevant for estimating the funding requirements of the direct-care system.

Although the HCFA index is based on a sample of Medicare-certified hospitals, it covers *all* of the inputs applied at those hospitals, not just the inputs applied in treating Medicare patients. Moreover, the HCFA index is probably applicable to DoD *outpatient*

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10 "Medicare Program; Changes to the Hospital Inpatient Prospective Payment Systems and Fiscal Year 1997 Rates; Final Rule," *Federal Register*, Vol. 61, No. 170, August 30, 1996, pp. 46,166-46,328. Annual updates appear around the same time of year in each volume of the *Federal Register*.

11 The quotation is from Mark S. Freeland et al., "Measuring Hospital Input Price Increases: The Rebased Hospital Market Basket," *Health Care Financing Review*, Vol. 12, No. 3, Spring 1991, p. 2. An earlier account is given in Mark S. Freeland, Gerard Anderson and Carol Ellen Schendler, "National Hospital Input Price Index," *Health Care Financing Review*, Vol. 1, No. 1, Summer 1979.

care as well as inpatient care because, unlike the civilian medical sector, DoD provides most of its outpatient care within the hospital setting.

The HCFA index is designed to capture pure changes in input prices, without any contamination by technology or intensity:

> The hospital price index, or market basket, is a statistical construct designed to measure the "pure" price increase component of rising hospital expenditures. The hospital input price index measures the change in costs to the hospital for a fixed set of production inputs from a defined base period...Because the hospital input price index is fixed-weight, it separates the changes in costs of a known level and type of care from cost increases resulting from changes in the hospital input mix *or changes in the volume and intensity of services*. It is in this sense that the hospital input price index is a measure of pure price change.[12] [emphasis added]

The HCFA index is less susceptible to quality/technology bias than is the CPI–M. The latter index measures the prices paid by consumers for medical treatments that embody an ever-increasing level of technology and, presumably, quality. The BLS has conceded that it is extremely difficult to remove these factors from the CPI–M. The HCFA index, by contrast, measures the prices of *inputs* to medical care. Although medical providers are undoubtedly more highly trained than in the past, the increases in their wages are most likely driven by pure inflation rather than by quality improvement.

2. Index Construction

The HCFA hospital input-price index is constructed in four stages.[13] First, distinct expense categories are defined that account for all hospital operating costs. Note that capital costs (e.g., interest, depreciation) and incremental GME costs are excluded from the definition of operating costs. Second, the proportional distribution of operating costs across the expense categories is estimated from base-year data. The expenditure weights are updated or "re-based" roughly every 5 years, based on HCFA's analysis of the Medicare Cost Reports. In FY 1997, for example, the weights were updated from FY 1987 values to FY 1992 values. Third, a price proxy is selected for each expense

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12 Mark S. Freeland et al., "Measuring Hospital Input Price Increases: The Rebased Hospital Market Basket," 1991, p. 1.

13 This description and the accompanying tables are adapted from "Medicare Program; Changes to the Hospital Inpatient Prospective Payment Systems and Fiscal Year 1997 Rates; Final Rule," pp. 46,186-46,193.

category. Finally, the composite index is computed as the expenditure-weighted average of the various price proxies.

Table III-1 shows the FY 1997 expense categories, expenditure weights, and price proxies. A hierarchical approach is used to select price proxies for each expense category. A PPI is used, if available, to measure the prices of goods and services traded in wholesale markets. A CPI subindex is used if no appropriate PPI is available, or if the goods and services are traded in retail markets. As an example of the latter, the CPI subindex for "food away from home" is used as the price proxy for the expense category "contracted food services." Employment cost indices (ECIs) are used to measure changes in employee wage rates, as well as employer costs for employee benefits per hour worked (e.g., Social Security contributions, pensions, insurance, and paid leave). ECIs are estimated by the BLS as fixed-weight indices within a given industry or occupation. Finally, average hourly earnings (AHE) are computed by dividing gross payroll within a given industry or occupation by the total hours worked. Because AHEs do not hold constant the employment mix, thus confounding pure inflation with shifts in the employment mix, they are less desirable than ECIs. Moreover, because AHEs are restricted to payroll costs, thereby excluding employer costs for employee benefits, use of an AHE implicitly assumes that benefits increase at the same rate as payroll costs. To avoid these difficulties, AHEs are used only if no appropriate ECI is available.

Note that wages and salaries receive 50.2% of the weight in the HCFA index. Table III-2 shows the expense categories, expenditure weights, and price proxies for the wages and salaries subindex. Within the subindex, professional and technical workers receive 65.7% of the weight. HCFA uses a 50/50 blend of the ECI for civilian hospital workers and the ECI for professional, specialty and technical workers (not necessarily employed in hospitals). HCFA's rationale for the 50/50 blend is that civilian hospitals employ not only medical professionals (e.g., registered nurses and physical therapists), but also non-medical professionals such as computer programmers, biological researchers, social workers, accountants, and lawyers. Because civilian hospitals compete for the latter occupations in the broader civilian economy, an economy-wide ECI is appropriate for determining inflationary increases.

Table III-1. FY 1997 Prospective Payment Hospital Expense Categories, Expenditure Weights, and Price Proxies

Expense Category	Expenditure Weight	Price Proxy
1. Compensation	61.390	
A. Wages and Salaries	50.244	HCFA occupational wage index
B. Employee Benefits	11.146	HCFA occupational benefits index
2. Professional Fees	2.127	ECI–compensation for professional, specialty and technical
3. Energy and Utilities	2.469	
A. Fuel, Oil and Gasoline	0.345	PPI–refined petroleum products
B. Electricity	1.349	PPI–commercial electric power
C. Natural Gas	0.670	PPI–commercial natural gas
D. Water and Sewerage	0.106	CPI–U water and sewerage maintenance
4. Professional Liability Insurance	1.189	HCFA professional liability insurance premium index
5. All Other	32.824	
A. All Other Products	24.033	
1) Pharmaceuticals	4.162	PPI–pharmaceutical preparations
2) Food: Direct Purchase	2.363	PPI–processed foods and feeds
3) Food: Contract Service	1.096	CPI–U food away from home
4) Chemicals	3.795	PPI–industrial chemicals
5) Medical Instruments	3.128	PPI–surgical and medical instruments and apparatus
6) Photographic Supplies	0.399	PPI–photographic supplies
7) Rubber and Plastics	4.868	PPI–rubber and plastic products
8) Paper Products	2.062	PPI–converted paper and paperboard products
9) Apparel	0.875	PPI–apparel
10) Machinery and Equipment	0.211	PPI–machinery and equipment
11) Miscellaneous Products	1.074	PPI–finished goods
B. All Other Services	8.792	
1) Business Services	3.823	ECI–compensation for private workers in business services
2) Computer Services	1.927	AHE–computer and data processing services
3) Transportation Services	0.188	CPI–U transportation
4) Telephone Services	0.531	CPI–U telephone services
5) Postage	0.272	CPI–U postage
6) All Other–Labor Intensive	1.707	ECI–compensation for private service occupations
7) All Other–Nonlabor Intensive	0.344	CPI–U all items
TOTAL:	100.00	

Table III-2. FY 1997 Prospective Payment Hospital Wages and Salaries Subindex

Expense Category	Expenditure Weight	Price Proxy
1. Professional and Technical	65.729	Equal blend of ECI for wages and salaries of civilian hospital workers and ECI for wages and salaries of professional, specialty, and technical workers
2. Managers and Administrators	9.554	ECI for wages and salaries for executive, administrative and managerial workers
3. Sales	0.402	ECI for wages and salaries for sales workers
4. Clerical Workers	12.379	ECI for wages and salaries for administrative support including clerical workers
5. Craft and Kindred	1.689	ECI for wages and salaries for precision production, craft and repair workers
6. Operatives Except Transport	0.437	ECI for wages and salaries for machine operators, assemblers and inspectors
7. Transport Equipment Operatives	0.122	ECI for wages and salaries for transportation and material moving workers
8. Nonfarm Laborers	0.084	ECI for wages and salaries for handlers, equipment cleaners, helpers and laborers
9. Service Workers	9.606	ECI for wages and salaries for service occupations
Total Wages and Salaries	100.00	Total weight for wages and salaries is 50.2

Apart from wages and salaries, another area of concern is pharmaceuticals. The HCFA index assigns 4.2% of the weight to pharmaceuticals, and the PPI for pharmaceutical preparations [Standard Industrial Classification (SIC) 2834] is used as the price proxy. Between February 1990 and February 1996, the annualized growth rate of the PPI exceeded that of the overall HCFA index by about one percentage point, 4.07% versus 3.09%.[14]

The overall HCFA index has behaved similarly to the DoD Comptroller's index for O&M (less fuel and civilian pay), lending some credibility to the earlier speculation that input prices may inflate at similar rates in the military and civilian medical sectors. We exclude fuel from the O&M index because the DHP consumes fuel in much smaller proportions than do the combat forces. We also exclude civilian pay for the moment, though we will return to the proper treatment of civilian pay in Chapter IV. Figure III-1 compares the growth rates of the HCFA and O&M indices over the period FY 1990

14 The HCFA hospital input-price index is available at the following web site: http://www.hcfa.gov/stats/TB10962.TXT. The PPI is available at the Bureau of Labor Statistics web site, http://stats.bls.gov/cgi-bin/surveymost. The series that we used is the PPI for pharmaceutical preparations, not seasonally adjusted, Series ID PCU2834#.

through FY 1995. The annualized growth rates over the period are quite similar, 3.17% for the HCFA index versus 2.72% for the O&M index.[15]

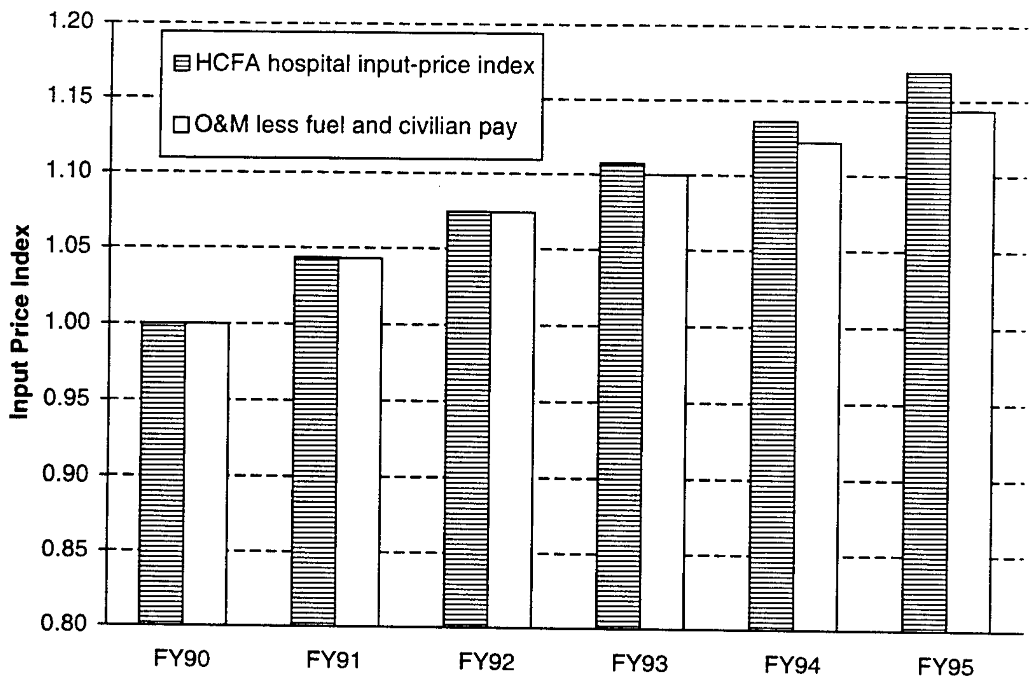

Figure III-1. Comparison Between DoD O&M Deflator and HFCA Hospital Input-Price Index

3. PPI–Surgical and Medical Instruments and Apparatus

Before concluding our discussion of the HCFA index, we will highlight one particular PPI that we will later consider applying more broadly within the DHP context. The PPI for surgical and medical instruments and apparatus (SIC 3841) is used as the price proxy for the expense category "medical instruments." This index reflects sales by "establishments primarily engaged in manufacturing medical, surgical, ophthalmic, and veterinary instruments and apparatus."[16] The exact composition of this index is reproduced in Appendix C. In particular, the index *excludes* sales in the following related areas, which are covered by SICs other than 3841:

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[15] The O&M index is taken from "National Defense Budget Estimates for FY 1998," Table 5-9.

[16] U.S. Office of Management and Budget, *Standard Industrial Classification Manual—1987*, Washington, D.C., 1987, p. 250.

- orthopedic, prosthetic, and surgical appliances and supplies;
- dental equipment and supplies;
- X–ray apparatus and tubes and related irradiation apparatus; and
- electromedical and electrotherapeutic apparatus.

4. Index Forecasts

Data Resources, Inc. (DRI)/McGraw-Hill produces forecasts of the hospital input-price index under contract to HCFA. The forecasts are made approximately 5 months before the beginning of the fiscal year in question. For example, the forecast for FY 1998 will be available by May 1997 and will be used to set the FY 1998 PPS rates. In fact, DRI actually produces forecasts over a 10-year horizon (i.e., forecasts are currently available through FY 2007), although the out-year values are more speculative and extend beyond the Future Years Defense Program (FYDP) anyway. DRI builds its forecasts of the hospital input-price index by first forecasting the component subindices, such as the various PPIs and ECIs. DRI then combines the various subindices using the weighting scheme developed by HCFA (reproduced earlier in Table III-1).

C. HCFA MEDICARE ECONOMIC INDEX

We have suggested that the HCFA hospital input-price index be applied to DoD outpatient as well as inpatient direct care. A possible alternative for outpatient direct care is HFCA's Medicare Economic Index.[17] The MEI is used to update payments for physician services under Medicare Part B. The MEI is oriented toward care delivered in the physician's office rather than in the hospital setting. Therefore, the analogy to outpatient direct care is not particularly strong.

The structure of the MEI is shown in Table III-3. The MEI assigns 54.2% of the weight to compensation for the physician's own time, and the remaining 45.8% of the weight to medical practice expenses. Note, however, that the price proxy for the physician's wages and salaries is the AHE for production and non-supervisory workers in the total private non-farm economy. Similarly, the price proxy for the physician's fringe benefits is the ECI for the same sector of the economy. These price proxies were chosen by HCFA in a deliberate attempt to tie physicians' net income to general, economy-wide changes in compensation:

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17 Mark S. Freeland et al., "Measuring Input Prices for Physicians: The Revised Medicare Economic Index," *Health Care Financing Review*, Vol. 12, No. 4, Summer 1991, pp. 61-73.

> The legislative history of the MEI reveals congressional concern that increases in physician charges were a cause, rather than a result, of inflation...The [Senate Finance] Committee's expectation that the rate of price inflation assigned to the physician's own time portion of the MEI be permitted to increase by an amount consistent with increases in general earnings levels seems to reflect Congress' preference for *an equitable external price proxy, that is, a compensation proxy that is based on compensation outside the physician services industry.*[18] [emphasis added]

Table III-3. Medicare Economic Index: Expense Categories, Expenditure Weights, and Price Proxies

Expense Category	Expenditure Weight	Price Proxy
1. Physician's Own Time	54.16	
A. Wages and Salaries	45.34	AHE–production and non-supervisory workers, total private non-farm
B. Fringe Benefits	8.81	ECI–benefits, production and non-supervisory workers, total private non-farm
2. Medical Practice Expenses	45.85	
A. Non-Physician Employee Compensation	16.30	
1) Wages and Salaries	13.79	
a. Professional/Technical	3.79	ECI–wages and salaries, professional/technical
b. Managers	2.62	ECI–wages and salaries, administrative/managerial
c. Clerical	5.07	ECI–wages and salaries, clerical
d. Craft	0.07	ECI–wages and salaries, craft
e. Services	2.23	ECI–wages and salaries, service occupations
2) Fringe Benefits	2.51	ECI–benefits, private white-collar
B. Office Expense	10.28	CPI–U housing
C. Medical Materials and Supplies	5.25	Equal blend of: PPI–ethical (prescription) drugs, PPI–surgical appliances and supplies, CPI–U medical equipment and supplies
D. Professional Liability Insurance	4.78	HCFA survey of average premiums among nine major insurers
E. Medical Equipment	2.35	PPI–medical instruments and equipment
F. Other Professional Expenses	6.89	
1) Automobile	1.40	CPI–U private transportation
2) Other	5.49	CPI–U all items less food and energy
TOTAL:	100.00	

18 Ibid., pp. 66-67.

Use of an external price proxy may be sensible public policy with regard to the Medicare program; however, it contributes to making the MEI a poor analogy to outpatient direct care. By contrast, the HCFA hospital input-price index assigns 50.2% of the weight to wages and salaries, weighted across the *specific mix of occupations* employed in civilian hospitals (Table III-2). Therefore, the latter index appears to be a more suitable analogy to outpatient direct care.

D. PPI–GENERAL MEDICAL AND SURGICAL HOSPITALS

Another possible general-purpose index is the PPI for general medical and surgical hospitals (SIC 8062). The BLS began publication of this index in January 1993. The PPI measures the revenue received by a hospital for the entire bundle of services rendered during a hospital stay, less any discounts from total billed charges. The bundle of services includes room charges, medical supplies, drugs, ancillary services, and "built-in" physician services (i.e., the services of staff radiologists, pathologists, and anesthesiologists would be included, but a surgeon's professional fee would most likely be billed separately). The PPI also gives a small amount of weight to non-medical sources of hospital revenue, such as cafeteria services and gift shops. Unlike the CPI–M, Medicare and Medicaid patients are included in the PPI sampling frame. Military hospitals, Veterans Administration hospitals, and the National Institutes of Health (NIH) are excluded, however, because there is no economic transaction between the patients and the hospital.[19]

Since its inception, the PPI has increased somewhat less rapidly than the CPI–M.[20] Between January 1993 and November 1996, the PPI grew at an annual rate of 2.99% versus 4.27% for the CPI–M. More recently, between January 1995 and November 1996, the PPI grew at an annual rate of 2.08% versus 3.48% for the CPI–M. The disparity between these two indices is not as great as has sometimes been reported. For example, the Boskin Commission erroneously reports that "...the Producer Price Index (PPI)...also prices inputs [sic] but with different weights [from the CPI–M], and increases by roughly 2.0 percent per year more slowly than the CPI in both the doctor and

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19 Bonnie Murphy, "A Description of the PPI Hospital Services Initiative," BLS staff paper, 1992; and Brian Catron and Bonnie Murphy, "Hospital Price Inflation: What Does the New PPI Tell Us?" *Monthly Labor Review*, July 1996, pp. 24-31.

20 The PPI is available at the Bureau of Labor Statistics web site, http://stats.bls.gov/cgi-bin/surveymost. The series that we used is the PPI for general medical and surgical hospitals, not seasonally adjusted, Series ID PCU8062#.

hospital category in the recent past (1995–96)."[21] In fact, the PPI actually prices *outputs* (the bundles of services provided by hospitals), not inputs. Also, many of the services are provided to Medicare patients, so that the associated hospital revenues are determined by the PPS payment schedule and are not necessarily synonymous with hospital costs. Thus, the PPI is not especially relevant for measuring input-price inflation in the DoD direct-care sector.

Nor is the PPI appropriate for DoD purchased care. The PPI measures revenues that civilian hospitals generate by providing *inpatient* care to patients under a wide variety of insurance plans, among them government programs and commercial fee-for-service (FFS) plans. DoD purchases nearly as much outpatient care as inpatient care, so that the PPI hospital index does not have a wide enough scope.[22] More important, DoD purchases care in an environment that may be increasingly characterized as "managed-care," so that the FFS information embedded in the PPI is not relevant and probably overstates inflation. It would be possible to refine this upper bound on the purchased-care inflation rate. The BLS publishes PPI subindices for inpatient care rendered to Medicare patients, Medicaid patients, and all other patients (respective series IDs 8062131, 8062151, and 8062171). Even when concentrating on the latter subindex, the result is still an upper bound for DoD purchased care because many of the "other patients" are covered by FFS insurance plans in which the cost controls are not as stringent as those found in DoD purchased care.

21 Michael Boskin et al., "Toward a More Accurate Measure of the Cost of Living," p. 59.

22 During FY 1994, CHAMPUS expenditures were $1.28 billion for outpatient care versus a total of $1.39 billion for institutional care and institutional professional services. These figures are taken from "CHAMPUS Chartbook of Statistics," Office of the Civilian Health and Medical Program of the Uniformed Services, OCHAMPUS Guide 5400.2-CB, December 1995, p. III-5. To expand the scope to include outpatient care, one could supplement the PPI hospital index with the PPI for offices and clinics of doctors of medicine, Series ID PCU8011#. The latter index has been published only since January 1994.

IV. MEDICAL INFLATION INDICES FOR THE DEFENSE HEALTH PROGRAM

IV. MEDICAL INFLATION INDICES FOR THE DEFENSE HEALTH PROGRAM

This chapter first reviews the inflation indices currently used to prepare the annual DHP budget justification. It then considers the utility of substituting the PPI and HCFA indices for those currently used to inflate selected portions of the DHP:

- PPI for surgical and medical instruments and apparatus, and
- HCFA hospital input-price index.

Finally, an alternative treatment is proposed for Managed-Care Support contracts and traditional CHAMPUS, which are currently inflated by the CPI–M.

A. INFLATION INDICES CURRENTLY IN USE

A variety of inflation indices are currently used to prepare the annual DHP budget justification. The Military Personnel appropriation is inflated using the military pay raise assumption published in the OSD Comptroller's Revised Inflation Guidance.[1] An adjustment is also made for changes in the paygrade structure of DHP military personnel.

The procedure for inflating O&M is considerably more complicated. There is a matrix relationship between subactivity groups and object classes. The following are the nine subactivity groups:

- Direct Patient Care,
- Patient Care Support,
- CHAMPUS,
- Office of CHAMPUS (OCHAMPUS),
- Managed-Care Support Contracts,
- Care in Non-Defense Facilities,
- Education and Training,

1 "Revised Inflation Guidance," Department of Defense, Office of the Undersecretary of Defense (Comptroller), issued annually; also available at the following web site: http://www.dtic.dla.mil/dodim/costweb.html [accessed April 7, 1997].

- Uniformed Services University of the Health Sciences (USUHS), and
- Base Operations Support.

Along the other dimension of the matrix there are roughly 70 object classes, a few of which will be highlighted in the subsequent discussion. The funding requirement for each combination of subactivity group and object class may either increase or decrease, due to the net effects of three factors:

- foreign currency adjustment (zero for most object classes),
- price growth (i.e., inflated cost for the same volume of goods and services), and
- program growth (i.e., increased volume of goods and services).

Appendix D contains the complete sets of object classes and corresponding inflation rates used to construct both the FY 1995 and FY 1996 DHP budget requirements.

Some 32 distinct inflation rates were applied in constructing the FY 1996 budget requirement.[2] The range of inflation rates is indicated in Figure IV-1. The rates in the +5% to +6% range are stock-fund reconciliation rates for the Defense Fuel Supply Center (DFSC, object class 401), Service Fuel Fund (object class 402), Army Supply and Materials (object class 411), and Army Fund Equipment (object class 502). These rates were applied to a base of only $53 million. At the other extreme, negative stock-fund reconciliation rates (as low as –23.2% in magnitude) were applied to a base of $183 million.

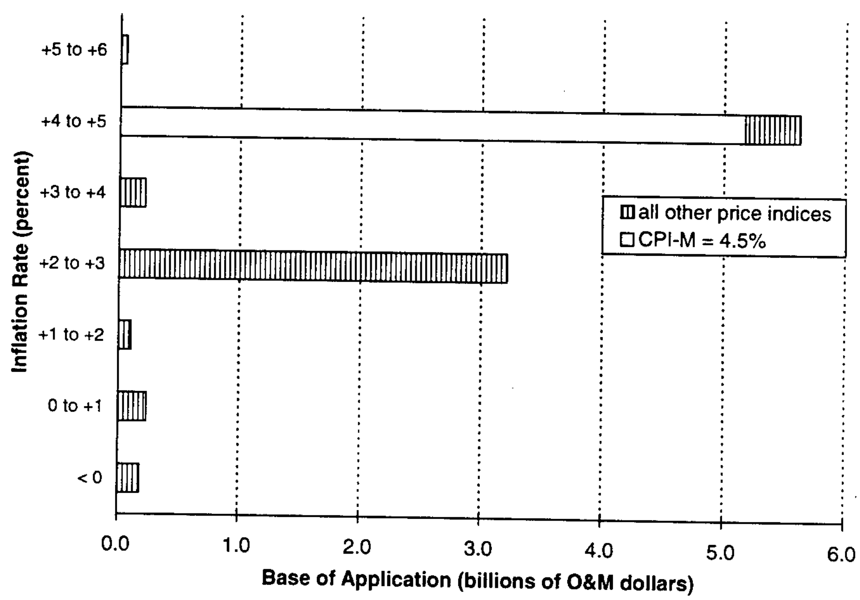

Figure IV-1. Inflation Rates Applied in Constructing the FY 1996 DHP

2 "Defense Health Program, Fiscal Year 1997: Justification of O&M Estimates," Department of Defense, Office of the Assistant Secretary of Defense (Health Affairs), Exhibit OP-32.

The projected growth in the CPI–M is used to inflate the entire Managed-Care Support subactivity group, essentially the entire CHAMPUS subactivity group, and selected object classes within three additional subactivity groups (to be detailed below). The projected CPI–M growth of 4.5% was published in the OSD Comptroller's "Revised Inflation Guidance." This rate was applied to a base of $5.17 billion, comprising just over one-half of the DHP O&M and one-third of the entire DHP. The actual growth in the CPI–M between mid–FY 1995 and mid–FY 1996 (i.e., between April 1995 and April 1996) was 3.7%, somewhat lower than the projection.

An alternative view of the procedure for inflating O&M is shown in Figures IV-2 and IV-3. To the right of the solid line in Figure IV-2 are the funding categories (i.e., combinations of subactivity groups and object classes) that are inflated by the CPI–M. These funding categories include the entire Managed-Care Support subactivity group ($0.93 billion), essentially the entire CHAMPUS subactivity group ($2.40 billion), plus an additional $1.84 billion. To the left of the solid line are the funding categories that are inflated by indices other than the CPI–M. The stock-fund reconciliation rates have already been discussed. Civilian pay is inflated using the civilian pay raise assumption published in the OSD Comptroller's "Revised Inflation Guidance." The remaining funding category, "non-labor, non-stock-funded," is inflated by a variety of indices, predominantly the O&M rate excluding fuel and civilian pay, which is also published in the "Revised Inflation Guidance."

Figure IV-3 breaks out the $1.84 billion that is inflated by the CPI–M outside of the Managed-Care Support and CHAMPUS subactivity groups (i.e., the slice in the southeast of Figure IV-2). Note that we have annotated both Figure IV-2 and Figure IV-3 to indicate alternative indices that could potentially be applied to various segments of DHP O&M. For example, the CPI–M is currently applied within the Direct Patient Care subactivity group to both the minor Equipment Purchases (unit cost at most $100,000) and Supplies and Materials object classes. We will recommend substituting the PPI for surgical and medical instruments and apparatus (see Chapter III). This substitution is desirable because the PPI reflects transactions made in wholesale markets, while the CPI–M reflects transactions made in retail markets. The effects of this and other substitutions will be explored in the next section.

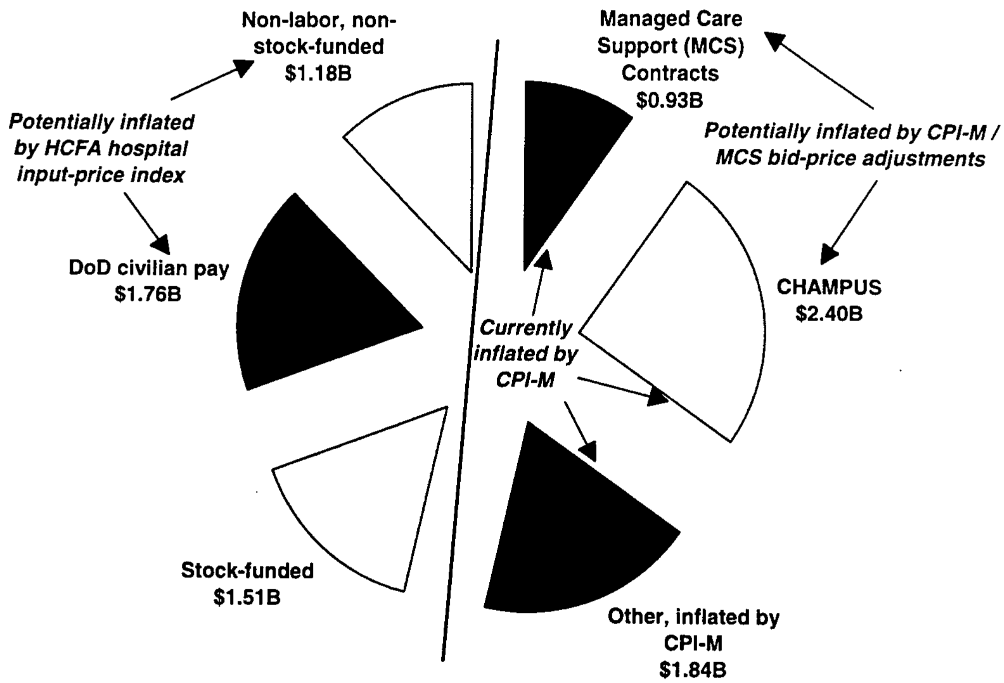

Figure IV-2. Composition of DHP O&M, FY 1995 Base Used to Construct the FY 1996 DHP

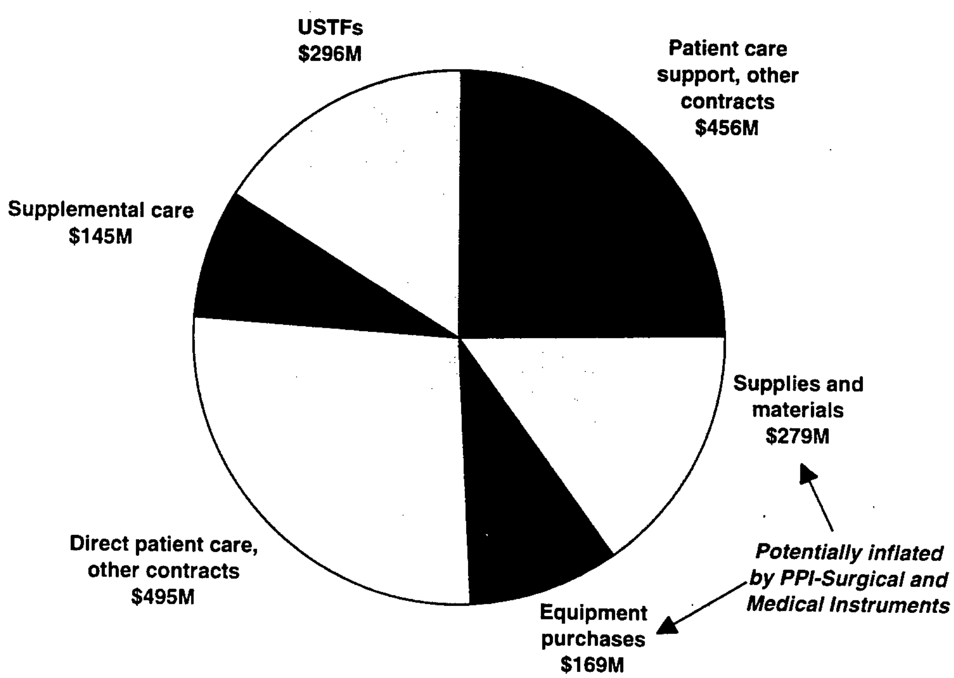

Figure IV-3. Composition of "Other, Inflated by CPI–M" Funding Category, FY 1995 Base Used to Construct the FY 1996 DHP

We do not propose any alternatives to the CPI–M for the four remaining categories shown in Figure IV-3. Both Supplemental Care and the USTFs represent direct purchases of medical outputs from the civilian economy. The final two categories, Direct Patient Care and Patient Care Support (both in the Other Contracts object class) represent contracted services in such areas as public and occupational health. The specific services purchased include the following:

- medical epidemiology and entomology;
- drinking water safety;
- hazardous waste disposal;
- food sanitation;
- community health nursing;
- assessment of workplace health hazards;
- employee health surveys;
- tracking exposure to physical, chemical, and biological stresses; and
- veterinary services.

Notwithstanding the known problems with the CPI–M, it probably remains the most appropriate index for these purchases from the civilian economy.

B. EFFECTS OF SUBSTITUTING ALTERNATIVE INFLATION INDICES

In this section we consider the utility of using the PPI for surgical and medical instruments and apparatus and the HCFA hospital input-price index as alternative inflation indices to those currently used to construct the DHP. We will also consider an alternative treatment of the Managed-Care Support and CHAMPUS subactivity groups, which are currently inflated by the CPI–M. In fact, it is no longer necessary to distinguish between these two groups, because traditional CHAMPUS will be supplanted by MCS contracts once TRICARE is fully implemented in FY 1999. For this combined group, we will explore using the MCS Bid-Price Adjustments (BPAs) in conjunction with the CPI–M. This procedure differs from the others discussed in this section, because we will propose using the BPAs to determine the *total* funding increase for MCS contracts, and using the CPI–M to partition the total increase into price growth and program growth.

1. PPI and HCFA Hospital Input-Price Index

The CPI–M is currently applied within the Direct Patient Care subactivity group to both the Equipment Purchases ($169 million) and Supplies and Materials ($279 million) object classes. The CPI–M reflects transactions made in retail markets, and thus includes retail markups that DoD can avoid by purchasing instead in wholesale markets. The PPI (surgical and medical instruments and apparatus), which reflects transactions made in wholesale markets, appears more appropriate for determining DHP resource requirements.

A further-reaching step would be to substitute the HCFA hospital input-price index for the indices currently employed to inflate both civilian pay ($1.76 billion) and the miscellaneous category we have labeled as "non-labor, non-stock-funded" ($1.18 billion). This substitution would be desirable to the extent that a hospital-specific index, albeit from the civilian economy, more accurately measures direct-care inflation than does a set of non-hospital-specific indices from the military sector.

This issue hinges upon the appropriateness to the DHP of the expenditure weights and price proxies used to construct the HCFA index. The expenditure weights displayed in Table III-1 are summarized here in Figure IV-4. Wages and salaries, employee benefits, and professional fees receive a total of 63% of the weight in the HCFA index. By comparison, the proposed domain to which this index would be applied within the DHP contains $1.76 billion in labor expense and $1.18 billion in non-labor expense, implying a labor share of 60%. Because these shares are so similar, it does not seem necessary to reweight the HCFA index for application to the DHP.

The second concern is the appropriateness of the HCFA price proxies, particularly for professional and technical workers. The HCFA index uses a 50/50 blend of the ECI for civilian hospital workers (e.g., registered nurses and physical therapists) and the ECI for professional, specialty, and technical workers in the general civilian economy (e.g., computer programmers, biological researchers, social workers, accountants, and lawyers). It could be argued that the DoD civilian pay raise is exactly the correct price proxy. Indeed, it would be a relatively simple matter to substitute the civilian pay raise for the ECIs currently used to construct the HCFA index.

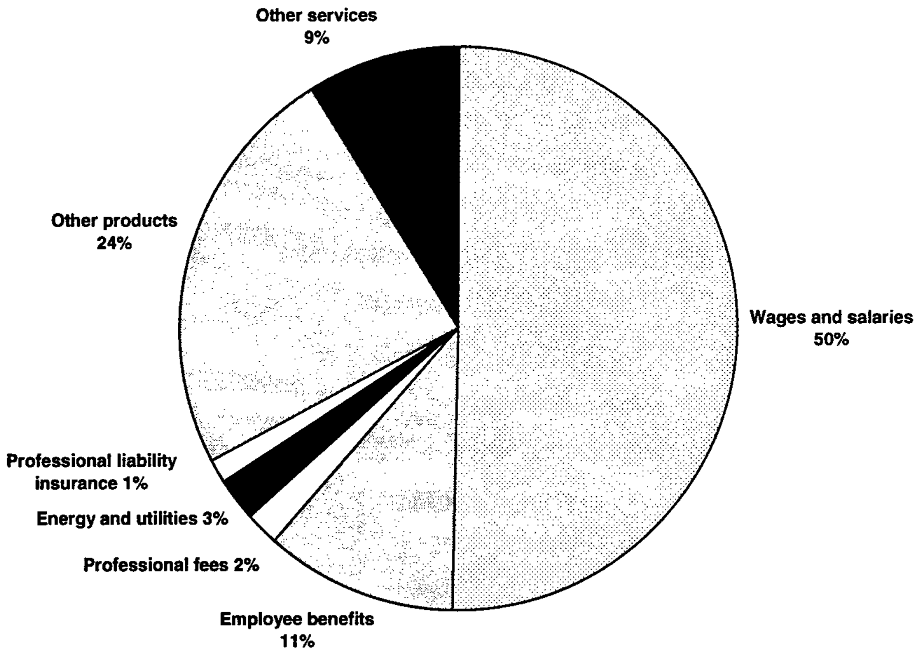

Figure IV-4. FY 1997 Expenditure Weights, HCFA Hospital Input-Price Index

On the other hand, the DoD civilian pay raise neglects medical occupational special pays (e.g., for nurses) that have been important and variable in the recent past. The HCFA index captures occupation-specific labor shortages and the resulting occupation-specific inflation, because it is based on the civilian labor market. To the extent that DoD special pays mirror the civilian labor market, the HCFA index could actually be more relevant than the across-the-board DoD pay raise.

As a practical matter, the HCFA labor subindex and the DoD civilian pay raise have moved nearly in lockstep during the 1990s. Figure IV-5 illustrates the two ECIs that are averaged by HCFA, as well as the DoD civilian pay raise.[3] Because these three series are so highly correlated, the choice of price proxy does not appear to make much difference.

Recall from Chapter III that the HCFA index assigns 4.2% of the weight to pharmaceuticals and that the annualized growth rate of the PPI for pharmaceutical preparations has exceeded that of the overall HCFA index by about one percentage point. It is difficult to determine whether the 4.2% weight is appropriate for application of the

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3 The ECIs are taken from "Medicare Program; Changes to the Hospital Inpatient Prospective Payment Systems and Fiscal Year 1997 Rates; Final Rule," p. 46,193. The DoD civilian pay raise is taken from "National Defense Budget Estimates for FY 1998," Table 5-12.

HCFA index to the DHP. Because they are not confined to any single object class, purchases of pharmaceuticals are not immediately visible in the DHP budget justification. However, pharmaceuticals constitute at least a subset of Locally Procured Supplies and Materials (object class 417) and Supplies and Materials (object class 920), which totaled $1.1 billion in FY 1996. Pharmaceuticals may constitute a subset of other object classes as well within the Direct Patient Care subactivity group. An independent estimate from OSD Health Affairs places pharmaceutical purchases at $660 million in FY 1996.[4] This sum includes prescription drugs dispensed to both MTF inpatients and MTF outpatients. It also includes prescription drugs dispensed at the MTF pharmacy to eligible beneficiaries filling prescriptions written by civilian physicians.[5]

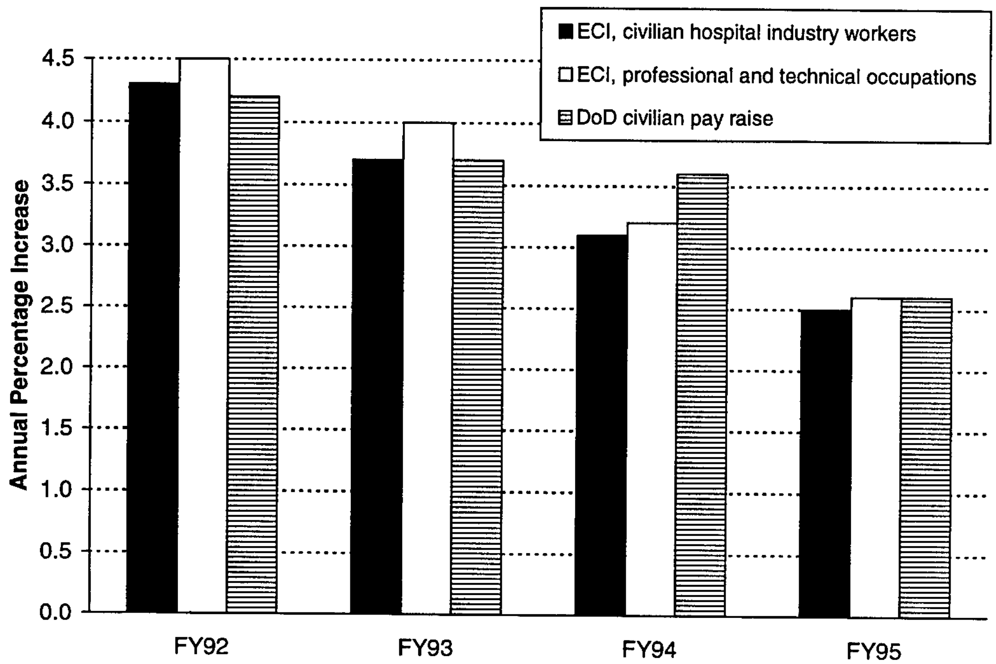

Figure IV-5. Comparison of Three Indices, Professional and Technical Workers

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4 Personal communication, Office of the Assistant Secretary of Defense (Health Affairs), Health Budgets and Programs.

5 Military retirees, who often have difficulty obtaining appointments with military physicians, may obtain prescriptions from civilian physicians and have them filled, free of charge, at MTF pharmacies. For CHAMPUS-eligibles, these prescription costs are recorded in the FCC (CHAMPUS beneficiary support) workcenter in MEPRS. Total FCC costs within CONUS were $230 million in FY 1995. However, this figure includes the labor costs of pharmacists and pharmacy technicians, so that the pure supply costs cannot easily be disentangled.

Accepting OSD Health Affairs' estimate of $660 million in annual pharmaceutical purchases, we must determine how much of this sum falls into the non-labor, non-stock-funded category to which we propose applying the HCFA index. This task is again difficult because the Supplies and Material object class, which presumably contains a large share of the pharmaceutical costs, is disjoint from the non-labor, non-stock-funded category (compare Figure IV-2 and Figure IV-3). At the most aggregate level, pharmaceutical purchases of $660 million constitute 6.7% of the FY 1996 O&M total of $9.84 billion. Thus, by using the HCFA index without modification, we risk understating the DHP O&M requirement by at most $2.5 million.[6]

Figure IV-6 shows the index values involved in substituting the PPI (surgical and medical instruments and apparatus) and the HCFA hospital input-price index for the indices currently used to construct the DHP. We show the projected CPI–M growth of 4.5%, the value used in the DHP budget justification, rather than the actual growth of 3.7% observed between mid–FY 1995 and mid–FY 1996. Conversely, because we did not have access to projections (as of mid–FY 1995) of either the PPI or the HCFA index, we show their actual growth rates instead.

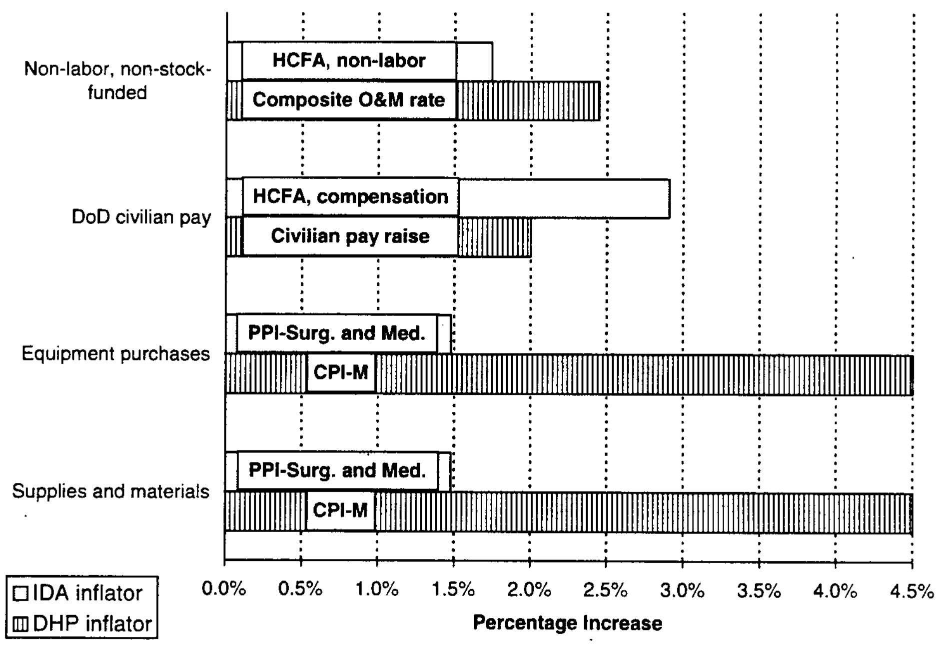

Figure IV-6. Alternative Indices for Constructing the FY 1996 DHP

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6 To compute this bound, we apply the faster-growing PPI to 6.7% rather than merely 4.2% of the O&M base of $9.84 billion. Because the PPI for pharmaceutical preparations grows one percentage point faster than the overall HCFA index, we would increase funding by $1.0\% \times (6.7\% - 4.2\%) \times \$9.84\text{B} = \$2.5\text{M}$.

The largest disparity is between the PPI and the CPI–M, but the proposed domain of application for the PPI is relatively small ($0.45 billion). The proposed domain for the HCFA index is over six times as large ($2.94 billion). The HCFA subindex for compensation (i.e., wages and salaries, employee benefits, and professional fees), which receives 63% of the weight, grew nearly one percentage point faster than DoD civilian pay. However, the remaining 37% share of the HCFA index grew roughly three-quarters of a percentage point slower than the composite O&M rate used to inflate non-labor, non-stock-funded costs.

Table IV-1 shows the net effect of these substitutions. Each row of the table corresponds to a distinct funding category, and the 11 funding categories exhaust the FY 1995 O&M base of $9.63 billion. The alternative indices affect rows 1 and 2 of the table (substitution of the PPI), as well as rows 10 and 11 (substitution of the HCFA index). We do not propose any alternatives to the CPI–M for rows 3 through 6, nor to the stock-fund reconciliation rates in row 9. We will defer until the next section a discussion of row 7 (MCS contracts) and row 8 (CHAMPUS), which are currently inflated by the CPI–M.

Had the four substitutions been made, FY 1996 O&M funding would have declined by merely $5 million relative to actual funding. We also performed a similar exercise for FY 1995. The index values that we used are shown in Figure IV-7. Observe that both the labor and non-labor components of the HCFA index grew faster than their DHP counterparts between mid–FY 1994 and mid–FY 1995. The four index substitutions would have reduced O&M funding by $6 million relative to actual funding (the detailed calculations are reported in Appendix E). Moreover, the respective funding decrements of $6 million in FY 1995 and $5 million in FY 1996 should be offset against a funding increment of up to $2.5 million, were we to apply the PPI for pharmaceutical preparations more widely within the DHP. Thus, the *net* funding decrements from the proposed index substitutions are roughly $3 million.

Table IV-1. O&M Price Growth Between FY 1995 and FY 1996, DHP Versus IDA Inflators (Thousands of Dollars)

Funding Category	Sub-Activity Group	Object Class Number	Object Class Description	FY 1995 Funding	Inflator DHP	Inflator IDA	Price Growth DHP	Price Growth IDA	Difference
1. Supplies and materials	Direct patient care	920	Supplies and materials	279,308	4.50%[a]	1.48%[b]	12,569	4,130	–$8,439
2. Equipment purchases	Direct patient care	925	Equipment purchases	169,289	4.50%[a]	1.48%[b]	7,618	2,503	–$5,115
3. Direct patient care, other contracts	Direct patient care	989	Other contracts	495,045	4.50%[a]	4.50%[a]	22,277	22,277	0
4. Supplemental care	Care in non-defense facilities	989	Other contracts	144,612	4.50%[a]	4.50%[a]	6,508	6,508	0
5. USTFs	Care in non-defense facilities	998	Other costs	295,712	4.50%[a]	4.50%[a]	13,307	13,307	0
6. Patient care support, other contracts	Patient care support	989	Other contracts	455,735	4.50%[a]	4.50%[a]	20,508	20,508	0
7. MCS contracts	Managed-care support	989	Other contracts	932,300	4.50%[a]	4.50%[a]	41,954	41,954	0
8. CHAMPUS	CHAMPUS	989	Other contracts	2,398,611	4.50%[a]	4.50%[a]	107,937	107,937	0
9. Stock-funded	Defense Health Program	301–799		1,508,860	–0.07%	–0.07%	–1,085	–1,085	0
10. DoD civilian pay	Defense Health Program	9XX	Reimbursable civilian pay	1,764,917	2.00%	2.46%[c]	35,298	43,375	$8,077
11. Non-labor, non-stock-funded	Residual			1,180,773	2.45%	2.46%[c]	28,900	29,019	$119
Total/Weighted Average				9,625,162	3.07%	3.02%	295,791	290,433	–$5,358

Source: "Defense Health Program, Fiscal Year 1997: Justification of O&M Estimates," Department of Defense, Office of the Assistant Secretary of Defense (Health Affairs), Exhibit OP–32.

Notes: a. Projected percentage increase in CPI–M, FY 1995 to FY 1996.
b. Actual percentage increase, PPI (surgical and medical instruments and apparatus), May 1995 to May 1996.
c. Actual percentage increase, HCFA hospital input-price index, May 1995 to May 1996.

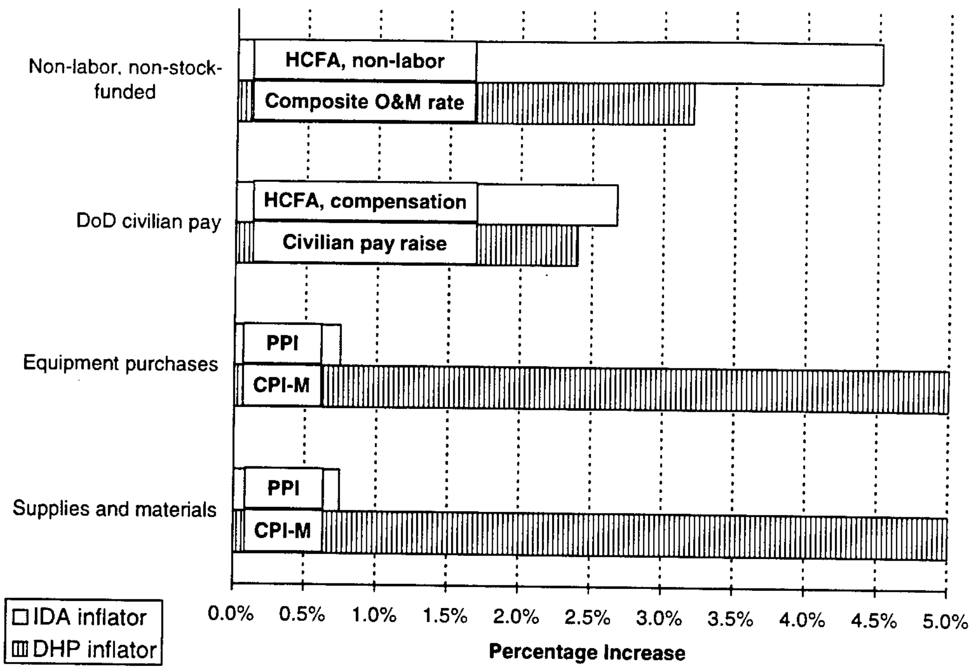

Figure IV-7. Alternative Indices for Constructing the FY 1995 DHP

In light of the small magnitudes of the funding decrements, it is tempting to dismiss the proposed index substitutions as having no practical impact on DHP funding. However, ongoing attempts by the BLS to refine the CPI–M (e.g., by removing the quality/technology bias) could lead to a slower-growing index, so that the fortuitous cancellation observed in Table IV-1 might not be repeated in future fiscal years. Even though we believe that the CPI–M is too generous when applied to Equipment Purchases or Supplies and Materials, that generosity is necessary to offset the funding loss from using the current inflators instead of the somewhat faster-growing HCFA index in other parts of the program (see Figure IV-6 and especially Figure IV-7). Thus, continued use of a decelerated CPI–M might actually *understate* the DHP budget requirement. To guard against this hazard, we recommend that index substitution be implemented.

Finally, we note that index substitution would require DoD to obtain forecasts of the PPI and the HCFA index. It may be possible to share this information with HCFA, who already has a contract with DRI/McGraw-Hill. At worst, DoD could purchase the forecasts directly from DRI/McGraw-Hill.

2. MCS Contract Bid-Price Adjustments

MCS contracts and CHAMPUS are currently inflated by the CPI–M. Because MCS contracts will completely supplant traditional CHAMPUS by FY 1999, these two subactivity groups may be combined for the purposes of the current discussion. The DHP already has an algorithm in place for updating the MCS funding requirement. We review their algorithm in this section and offer a suggestion for separating price growth from program growth. The DHP algorithm, augmented by our suggestion, should prove satisfactory for future budget justifications.

The TRICARE program divides the United States into 12 regions. A medical-center commander within each region is designated the Lead Agent for that region. The TRICARE Support Office (TSO), the successor to OCHAMPUS, has begun the process of procuring 7 MCS contracts to support the 12 Lead Agents by providing care outside of the MTFs. Each contract is of 5-year duration. All 12 regions are covered because some of the MCS contracts cover more than one region; e.g., a single contract covers Region 9 (Southern California), Region 10 (Golden Gate) and Region 12 (Hawaii). Contractual payments are modified by Bid-Price Adjustments, calculated in accordance with rules specified in each individual MCS contract. Although each MCS contract is different, the following general principles (with exceptions noted) are common to all of them.

Each contract is based on a forecast of the volume of workload to be performed by the MTFs within the region, with the contractor responsible for all residual workload. The three major dimensions of workload are the number of CHAMPUS-eligible beneficiaries, the number of Non-Availability Statements (NASs) issued by MTFs, and the number of outpatient visits delivered by MTFs. The actual numbers of NASs and outpatient visits are monitored during the 12-month Data Collection Period (DCP) that immediately precedes the start of each contract. The first BPA, which is calculated after the close of the first contract year, adjusts the contract baseline for differences between the forecasted MTF workload and actual MTF workload during that first contract year. This adjustment is necessary because the DCP reflects pre-TRICARE MTF workload, whereas the first contract year reflects the more relevant post-TRICARE MTF workload.

Subsequent BPAs provide for additional payments from DoD to the MCS contractor if the contractor's rate-of-return falls below a minimum threshold specified in the individual contract. Conversely, DoD reduces future payments if the contractor's rate-of-return exceeds a maximum threshold also specified in the contract. For example, the contract might specify a target profit rate of 5% and a "risk corridor" of between 5%

and 10%. Under these terms, the contractor shares with the government any profits in excess of 10%. On the downside, the government increases future payments if the contractor loses more than 1%. In contract years beyond the first one, the contractor must lose an amount equal to the sum of the previous years' profits (if positive) plus 1% in order to trigger increased payments by the government.

In addition to payments along this risk corridor, DoD may make additional payments in connection with contract change orders. Examples might include the introduction of new drugs or new medical procedures, if done at the behest of DoD rather than being judged cost-effective by the MCS contractor. In addition, TRICARE contains a Prime option which emulates Health Maintenance Organizations (HMOs) found in the civilian sector. Contract change orders might also include geographical extensions of the Prime option, again at the behest of DoD.

BPAs are calculated for most of the regions on an annual basis, at the close of each *contract* year (which may differ from the DoD fiscal year). The procedure will be somewhat different, however, for the final three regions to adopt TRICARE: Region 1 (Northeast), Region 2 (Mid-Atlantic), and Region 5 (Heartland). If a beneficiary from one of these regions enrolls in TRICARE Prime with an MTF designated as the Primary Care Manager (PCM), then the MTF commander is financially responsible for all of that beneficiary's health care. These MTF enrollees are "carved-out" of the MCS contract, so that the contractor bears no responsibility for their health care. By contrast, MCS contractors in the original nine regions are financially responsible for *all* enrollees, regardless of whether an MTF or a civilian provider is designated as the PCM. As a management tool for MTF commanders in Regions 1, 2 and 5, BPAs in these regions will be calculated on a quarterly basis.

Current DHP policy is to program for all identified funding requirements. These requirements include the initial MCS contract terms, as well as BPAs and contract change orders as soon as the latter are identified. The additional contract payments due to BPAs and contract change orders could easily span two DoD fiscal years, depending on the sequencing between the contract start date and the 1 October fiscal-year start date. Once again, Regions 1, 2 and 5 provide an exception because MCS contracts are not yet in place. Instead, future funding requirements have been estimated via Independent Cost Analyses (ICAs) performed within DoD. The latter requirements are generally replaced by actual MCS contract terms once the contract awards have been announced to the public.

Baseline adjustments are explicitly made in the initial BPA. Subsequent BPAs, based on the risk corridor, implicitly recognize at least the following set of factors that drive the contractor's rate-of-return:

- pure inflation,
- shifts in beneficiary population,
- shifts in utilization rates (including the effects of volume tradeoff factors),
- shifts in TRICARE Prime enrollment rates,
- extent of resource sharing,
- extent of provider discounts negotiated with subcontractors,
- efficacy of utilization management, and
- shifts in the intensity or technology of medical care.

In particular, the contractors are required to provide state-of-the-art medical care as compared to the norms established for Medicare providers. Thus a baseline allowance for I&T is already built into the MCS contracts, and the rate-of-return is affected only to the extent that contractors deviate from this baseline.

The only remaining issue is how to partition the total funding increment into price growth and program growth. Because DoD is contractually bound to pay the entire funding increment, the partitioning is essentially arbitrary. One possibility is to use the CPI–M as a benchmark, labeling as program growth any change in contract price in excess of the growth rate of that index:

$$\begin{aligned} \%\Delta\,\text{contract price} &= \%\Delta\,\text{CPI-M} + \left[\left(\%\Delta\,\text{contract price}\right) - \left(\%\Delta\,\text{CPI-M}\right)\right] \\ &= \text{price growth} + \text{program growth}. \end{aligned} \tag{1}$$

Note that program growth will be negative if the contract price grows less rapidly than the CPI–M.

Although ICAs have been performed for all 7 MCS contracts, the first set of BPAs has not yet been completed as of this writing. Thus FY 1999 will be the first fiscal year in which funding will be sensitive to the BPAs completed to that point. Even then, the BPAs will at most be useful for budgeting one year ahead. Suppose, for example, that a funding requirement is identified by a BPA completed in June 1998. This requirement may generate a stream of payments spanning the period July 1998 to June 1999. However, there is no information available in June 1998 for predicting additional funding

requirements for FY 2000 and beyond. For budgeting over the remainder of the FYDP, one alternative is to continue using forecasts of the CPI–M, in effect assuming zero program growth in the FYDP out-years. That procedure at least provides a placeholder for the FYDP out-years, which can later be modified when the BPAs become available.

V. REVIEW OF CIVILIAN LITERATURE ON INTENSITY AND TECHNOLOGY

V. REVIEW OF CIVILIAN LITERATURE ON INTENSITY AND TECHNOLOGY

This chapter contains a review of the civilian literature on I&T. After discussing five studies on this general topic, we highlight several additional studies that decompose trends observed in the Medicare case-mix index (CMI) since the implementation of the Prospective Payment System in 1984.

A. INTENSITY AND TECHNOLOGY

Two broad approaches have been used to measure I&T in the civilian medical sector. First, the "technology-specific" approach examines the impact of specific technologies on medical costs and often on medical outcomes as well. The disadvantage of this approach is that the results of a small set of case studies do not necessarily generalize to the totality of health care.

As an alternative, the "residual" approach infers that I&T is the portion of cost increases that cannot be directly attributed to other, measurable cost drivers. These drivers include, at a minimum, pure inflation (both general and "excess medical"), population size, and population composition. This approach is subject to two general types of error. First, the cost drivers may not be measured precisely. In particular, as we argued in Chapter III, there are many ways to measure medical inflation, none of which are entirely satisfactory for the problem at hand. Second, the residual no doubt contains factors other than I&T which get lumped together simply because they are difficult to explicitly measure and separate out. These factors may include the following:

- changes in productivity or efficiency,
- effects of regulation (e.g., imposition of a PPS payment schedule that induces hospitals to revise their DRG coding practices),
- changes in the competitive environment that affect profit margins (e.g., widespread negotiation of preferred-provider discounts), and
- changes in overhead rates (e.g., increases in liability insurance premiums or in the volume of indigent care).

The various estimates of I&T in the literature differ in their treatment of utilization. "Volume" is often defined as the number of encounters with the health-care system (per person per unit of time), whereas "intensity" or "technology" relate instead to resource consumption per encounter. The DHP Capitation Model largely accounts for volume changes through its estimation of full-time user equivalents and its further adjustments for age and sex. Thus, the most relevant civilian-sector studies for our purposes are those that remove changes in volume from their estimates.

We summarize five studies in Table V-1, and we discuss them individually throughout the remainder of this section.

1. Adamache and Cromwell

A recent study by the Center for Health Economics Research (CHER) defines "procedure intensity" as the average ratio of the number of selected procedures (both diagnostic and therapeutic) to inpatient admissions.[1] CHER investigated the role of procedure intensity in explaining cost differences across hospitals, as well as cost increases over time for the period FY 1985 through FY 1990. To control for case-mix differences across hospitals, 10 groups of homogeneous medical diagnoses were studied individually. One conclusion of the study is that procedure intensity (particularly of newer, high-technology procedures) continued to increase in spite of PPS. Although most of the growth in intensity was due to the diffusion of high-technology services, some low-technology services (e.g., X–rays) also continue to grow.

Intensity growth may be due to an apparently high rate of technical obsolescence in the hospital industry. For instance, before first-generation technology is fully diffused, a second-generation technology may already be introduced; similarly, partially substitutable technologies may diffuse at the same time. High growth in selected procedures leads to high rates of cost inflation in various hospital departments, among them surgical services and pharmacy.

Categorizing hospitals into five groups based on Medicare inpatient cost per admission (with some adjustment for case-mix and geographic input-cost differences), the study found that very high-cost hospitals show higher diagnostic and therapeutic procedure rates than average or low-cost hospitals. Between FY 1985 and FY 1990, the

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1 Killard W. Adamache, Jerry Cromwell et al., "Hospital Costs, Financial Status, and Market Structure," Center for Health Economics Research, Waltham, Mass., 1994.

Table V-1. Intensity Estimates from Previous Studies of Civilian Hospitals

Authors	Data	Approach	Definition of Intensity (% change)	Intensity Estimate (annual % change)
1. Adamache & Cromwell (1994)	Medicare, FY 1985 & FY 1990	Technology-specific	ΔProcedure rates within diagnosis groups	3% – 20%
2. Ashby & Altman (1992)	American Hospital Association, annual survey, 1981–1989	Residual	ΔDeflated charges for intermediate services per case-mix adjusted discharge	1.0%
3. Cromwell & Beaven (1994)	HFCA, National Health Expenditures (NHE), inpatient hospital services, 1984–1990	Residual	ΔDeflated cost per day, adjusted for age and sex	4.4%
	outpatient hospital services, 1984–1990	Residual	ΔDeflated cost per visit, adjusted for age and sex	5.6%
4. Sheingold & Richter (1992)	Medicare, FY 1985–FY 1991	Residual	ΔMedicare deflated charges per case-mix adjusted discharge	2.0%
5. ProPAC (1994)	Interviews & other, FY 1997 (projected)	Technology-specific	ΔMedicare operating cost per discharge due to new technology	2.0%

growth rates of cost and of established (in contrast to new) procedures were higher among the low- and very low-cost hospitals. Using regression analysis, intensity was estimated in the range of 3% to 20% for 9 of the 10 diagnosis groups examined.

Because it was based on case studies of only 10 medical diagnoses, Adamache and Cromwell's study does not necessarily generalize to the totality of inpatient care. Therefore, it has limited applicability to the process of determining the DHP budget requirement.

2. Ashby and Altman

Ashby and Altman define "productivity" as the ratio of admissions (adjusted for outpatient shift and real case-mix change) to labor full-time equivalents (FTEs).[2] They assert that productivity so defined is a key driver of hospital cost inflation. They further decompose productivity into two parts:

- *intermediate service productivity*, reflecting efficiency in producing intermediate services (e.g., operating-room hours, laboratory tests); and
- *case-mix-constant intensity*, reflecting changes in the number and complexity of intermediate services associated with a discharge of uniform complexity.

There are, in turn, several drivers behind increases in intermediate service output and intensity:

- longer lengths of stay,
- greater use of existing technology, and
- adoption of expensive new technology.

Ashby and Altman first estimated intermediate service productivity as the growth in intermediate outputs per unit change in FTEs. They then estimated case-mix-constant intensity as the growth rate in charges for intermediate outputs (deflated by the CPI–Hospital and Related Services) minus the growth rate in case-mix adjusted admissions. Their measure of case-mix-constant intensity may also be interpreted as the growth rate in the ratio of intermediate outputs to final output.

Ashby and Altman found that aggregate productivity declined by an annual average of 0.3% per year over the period 1981 to 1989, and total intermediate service output increased by 2.4% per year. They estimated that over the same period, intensity

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2 John L. Ashby and Stuart H. Altman, "The Trend in Hospital Output and Labor Productivity," *Inquiry*, Vol. 29, Spring 1992, pp. 80-91.

was 1.0% per year while intermediate productivity was 0.6% per year. Because intensity fuels the downward trend in aggregate productivity, Ashby and Altman consider it a major factor behind hospital cost inflation.

Several limitations of this study are worth noting. First, productivity was measured in terms of labor only. Second, in estimating the growth of intermediate services, Ashby and Altman based both the value of service units and the CPI–Hospital and Related Services largely on posted charges, which may not accurately reflect the relative costs of service units. Third, when measuring intermediate productivity change, it is difficult to sort out quality changes in the hospital product from productivity shifts.

3. Cromwell and Beaven

A recent study by the Health Care Technology Institute estimated both inpatient and outpatient intensity.[3] They examined the growth rates in cost per inpatient day (*not* discharge) and cost per outpatient visit at civilian community hospitals. They adjusted for both the HCFA hospital input-price index and trends in the age/sex composition of the patients treated. After making these adjustments, intensity was measured by the residual growth rates. They further decomposed the residuals into volume (for inpatient care, hospital days per 1,000 persons) and intensity (deflated cost per day).

Figure V-1 reproduces Cromwell and Beaven's findings for the period beginning with the introduction of Medicare's PPS in 1984. The high intensity rates during the mid-1980s probably reflect transitional anomalies due to the introduction of PPS. Inpatient intensity averaged 4.4% per year between 1984 and 1990. Although Cromwell and Beaven's estimate places them at the high end of the studies reviewed in this chapter, it must be recalled that theirs is the only study to examine cost per inpatient day rather than cost per discharge.

Cromwell and Beaven's main objective was to estimate the contribution of technology to the residual. Lacking a direct methodology for doing so, they simply replaced analysis with assumption: "Estimates, guesses really, of the technological component of each sector's residual were weighted by each sector's contribution to the overall residual...Two-thirds of the inpatient hospital residual, for example, was assumed

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3 Jerry Cromwell and Meredith Beaven, "Decomposition of the Health Care Spending Residual," Health Care Technology Institute, Alexandria, Va., PB-94-07, 1994, especially Table 5-4.

to be due to technology." They later conceded that their approach is, "ungrounded in empirical research."[4]

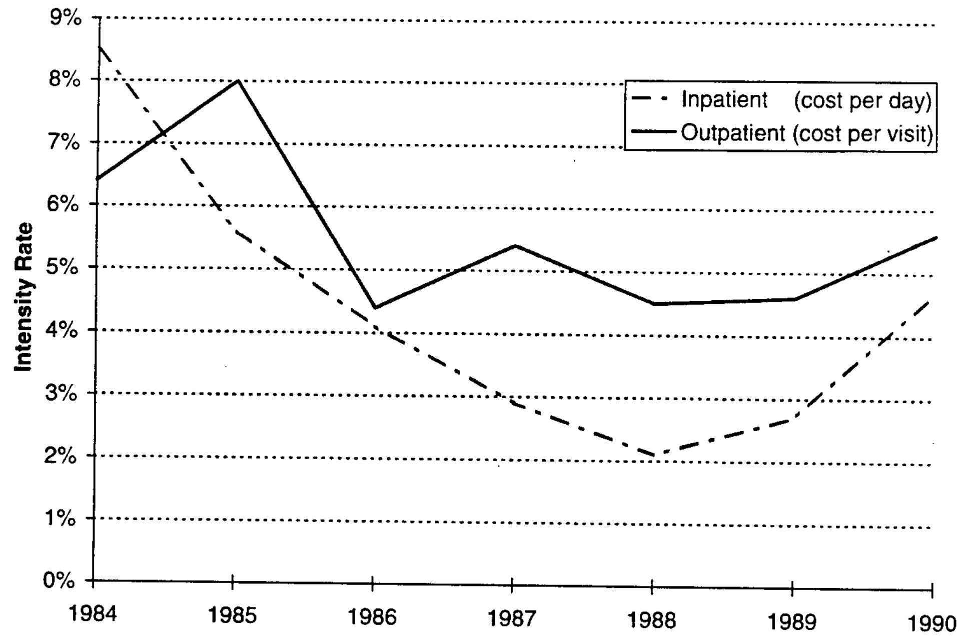

Figure V-1. Intensity Rate Trends for Civilian Community Hospitals (Source: Cromwell and Beaven, 1994)

Although Cromwell and Beaven's approach to the technology question is clearly unsatisfactory, it has little bearing on our study. From our perspective, Cromwell and Beaven's most important finding is that outpatient intensity has been at least as high as inpatient intensity; the former averaged 5.6% per year between 1984 and 1990. This finding will come into play in Chapter VI.

4. Sheingold and Richter

Sheingold and Richter address the adequacy of PPS operating payments for inpatient care. In so doing, they describe Medicare's update framework and its concept of intensity.[5] Under this framework, cost per discharge is decomposed into four factors:

- intermediate service productivity,
- case-mix-constant intensity,

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4 Ibid., quotations from pp. 1-4 and 5-17, respectively.

5 Steven H. Sheingold and Elizabeth Richter, "Are PPS Payments Adequate? Issues for Updating and Assessing Rates," *Health Care Financing Review*, Vol. 14, No. 2, Winter 1992, pp. 165-175.

- the case-mix index, and
- the input-price index.

Intermediate service productivity and case-mix-constant intensity were already defined in the discussion of Ashby and Altman. Case-mix-constant intensity includes at least the following set of conceptual elements:

- changes in the use of quality-enhancing (possibly high-technology) services,
- changes in practice patterns (i.e., the number and complexity of services), and
- changes in within-DRG severity.

The intent of including the intensity factor within the update framework is to reward the cost-effective use of intermediate services to produce a discharge.

Like Ashby and Altman, Sheingold and Richter estimated intensity as the growth rate in Medicare charges per admission (deflated by the CPI–Hospital and Related Services) minus the growth rate in case-mix adjusted admissions. They estimated intensity as 2.0% per year over the period FY 1985 to FY 1991. Also in common with Ashby and Altman, their price index is largely based on posted charges, which may not accurately reflect the relative costs of service units.

5. ProPAC FY 1995 Report to Congress

The Prospective Payment Assessment Commission (ProPAC) makes annual recommendations for updates to the PPS schedules pertaining to both operating costs and capital costs.[6] The operating-cost update consist of three parts:

- hospital input-price increases,
- discretionary adjustments, and
- case-mix adjustments.

Input-price increases are based on the HCFA hospital input-price index, discussed at length in Chapter III. ProPAC's case-mix adjustment will be described later in this chapter.

Discretionary adjustments include productivity as well as scientific and technological advances (S&TA). These adjustments are intended to reflect expected

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6 Prospective Payment Assessment Commission, "Report and Recommendations to the Secretary, United States Department of Health and Human Services, March 1, 1990," Washington, D.C., 1990, issued annually.

changes in the quantity and mix of resources consumed during a hospital stay. Since FY 1992, ProPAC has adopted the definitions of intermediate service productivity and case-mix-constant intensity offered by Ashby and Altman. ProPAC allows productivity adjustments in order to encourage hospitals to use existing inputs more efficiently or to adopt cost-saving technologies.

Although most intensity estimates inextricably include S&TA, ProPAC's methodology attempts to separately estimate S&TA.[7] A technology-specific approach is used to identify emerging technologies that improve the quality of medical care, albeit while increasing cost. ProPAC estimated intensity at 2.0% per year, this value representing the increase in Medicare operating costs per discharge that could be explicitly attributed to the adoption of new technologies.

ProPAC's method and the resulting estimates of the cost of S&TA are quite imprecise. For example, the long-run equilibrium cost of any emerging technology is difficult to forecast. Further, it is virtually impossible to sort out efficient from inefficient uses of technology. Finally, because the technologies are selected with the Medicare population in mind, the estimates have limited relevance to DoD direct care.

6. Summary

Most of the intensity estimates in the literature fall within the range of 1% to 2%, although Cromwell and Beaven's estimates are higher, and one of the specific technologies studied by Adamache and Cromwell produced an estimate as high as 20%. Unfortunately, these studies are not completely comparable because there is no consensus on the operational measurement of intensity. In principle, the concept of intensity seeks to capture the number and nature of intermediate services provided during a typical hospital stay (of uniform complexity). In practice, however, the literature offers many alternative conceptions of intensity. One version considers intensity as the residual of cost growth after accounting for price and volume changes. Another views intensity as the change in deflated cost per case within a DRG over a period, weighted by the proportion of cases in that DRG. In a more detailed analysis by diagnosis group, intensity may be defined as the ratio of specific (diagnostic or therapeutic) procedures to admissions within that group. When a measure of intermediate service output per

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7 Prospective Payment Assessment Commission, "Estimating Increases in Medicare Costs Due to Scientific and Technological Advances: The Incremental Impact of Scientific and Technological Advances on Capital Costs in PPS Hospitals (FY 1995)," Extramural Report E-94-03, January 1994.

discharge is available, case-mix-constant intensity can be computed as the change in the number and complexity of intermediate service outputs per discharge of uniform complexity. If a technology-specific approach is employed, the contribution to cost growth of scientific and technological advances, often included in the concept of intensity elsewhere, can be estimated separately.

In our own estimation of intensity in the next chapter, we will use the residual approach most closely aligned with Cromwell and Beaven. We, too, will adjust for both the HCFA hospital input-price index and the age/sex composition of the patients treated, although we will examine cost per discharge rather than cost per inpatient day. We will take care to avoid double-counting aspects of intensity that are already included in the DHP Capitation Model, particularly the age/sex adjustments.

B. DECOMPOSITION OF THE MEDICARE CASE-MIX INDEX

ProPAC examines the Medicare CMI in the context of updating the PPS operating-cost schedule. Any increase in CMI results in an equal percentage increase in hospital PPS payments. Given the incentives inherent in such a system, any observed change in the CMI may result from a "real" change in case-mix or, alternatively, from "upcoding." Real case-mix change is the response of patient resource requirements to a shift in either the mix of patients or the treatments they receive. By contrast, upcoding is the change in medical record documentation or coding that results in assigning cases to higher-weighted DRGs, without any increase in patient resource requirements. According to Stuart Altman (then Chairman of ProPAC):

> The DRG assignment for each case depends on the information entered on the medical record and the bill that the hospital submits to Medicare. Therefore, a great deal more attention has been paid to coding completeness and accuracy under PPS. Increases in coding completeness and accuracy may lead to the assignment of cases to higher-weighted DRGs, so this phenomenon (often referred to as upcoding or DRG creep) is thought to be associated with increases in the CMI. However, since it is not associated with increased patient resource requirements, it should not result in higher payments.[8]

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8 Stuart H. Altman, "Measuring Real Case Mix Change Under Medicare's Prospective Payment System," *Journal of Health Economics*, Vol. 9, 1990, p. 502.

ProPAC has used research conducted by the RAND Corporation and elsewhere to inform its deliberations. For example, the 1990 ProPAC report cited the work of Carter, Newhouse and Relles.[9] We summarize this and other related studies in Table V-2, and we discuss them individually throughout the remainder of this section.

Table V-2. Medicare CMI Decomposition from Previous Studies

Authors	Data	Proportion Real	Proportion Due to Coding
Ginsburg & Carter (1986)	Professional Activity Study, FY 1981–FY 1984	N/A	N/A
Carter, Newhouse & Relles (1990)	Super PRO Reabstracted Data, FY 1986–FY 1987	2/3	1/3
Carter, Newhouse & Relles (1991)	Super PRO Reabstracted Data, FY 1987–FY 1988	1/2	1/2
Goldfarb & Coffey (1992)	Hospital Cost & Utilization Project, FY 1980–FY 1986	1/2	1/2

1. Ginsburg and Carter

Ginsburg and Carter examined the sharp increase in the Medicare CMI that occurred between FY 1981 (pre-PPS) and FY 1984 (first year of PPS).[10] They estimated the following decomposition of the cumulative change in the CMI over that period:

- 2.8%, PPS-induced coding changes;
- 0.6%, outpatient substitution for inpatient treatments (e.g., migration of less complex procedures, such as cataract surgery, to the outpatient setting);
- 1.4%, trends in medical practice in place prior to PPS;
- 0.0%, aging of the Medicare population; and
- 4.0%, measurement error within the Medicare claims data base.

Outside of measurement error, PPS-induced coding changes accounted for just over half of the total change in CMI over the period studied. Unfortunately, Ginsburg and Carter were unable to further separate these coding changes into real changes versus upcoding.

9 Prospective Payment Assessment Commission, "Report and Recommendations to the Secretary, United States Department of Health and Human Services, March 1, 1990," especially pp. 39 and 68.

10 Paul B. Ginsburg and Grace M. Carter, "Medicare Case-Mix Index Increase," *Health Care Financing Review*, Vol. 7, No. 4, Summer 1986, pp. 51-65.

2. Carter, Newhouse and Relles

Carter, Newhouse and Relles continued the analysis of increasing Medicare CMI in a series of papers that used data spanning the more recent period FY 1986 through FY 1988.[11] Their objective was to precisely separate the real portion of the CMI increase from the portion due to upcoding. Their methodology was quite different and much more direct than Ginsburg and Carter's. Specifically, Carter, Newhouse and Relles made pairwise comparisons between the DRGs that were actually assigned to discharge records from an earlier year, and the DRGs that would have been assigned using the Grouper that was in effect during a later year. In this way, changes arising from upcoding and Grouper effects are eliminated to isolate the real case-mix change.

Carter, Newhouse and Relles' first paper found that about two-thirds of the total change in CMI between FY 1986 and FY 1987 was real; the remainder was due to upcoding and Grouper effects. This paper was strongly endorsed by the Chairman of ProPAC:

> The unique aspect of [Carter, Newhouse and Relles'] study was the availability of a "gold standard" for coding practices. The SuperPRO monitors the performance of the statewide Peer Review Organizations (PROs), which are intended to review the quality and appropriateness of care provided by hospitals under PPS. Among its activities is the reabstracting of medical records reviewed by each PRO and the comparison of the resulting DRG assignments. For the [Carter, Newhouse and Relles] study, the Super PRO was asked to again reabstract some of the records from FY 1986 at the same time it was reabstracting records from FY 1987. This meant that it was possible to compare records from two different years that had been reabstracted at the same time by the same coders.[12]

Interestingly, Carter, Newhouse and Relles' follow-up paper one year later found that only about one-half of the total change in CMI between FY 1987 and FY 1988 was real.

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11 The FY 1986 to FY 1987 analysis is contained in Grace M. Carter, Joseph P. Newhouse and Daniel A. Relles, "How Much Change in the Case-Mix Index Is DRG Creep?" *Journal of Health Economics*, Vol. 9, 1990, pp. 411-428; also available as RAND Corporation, R-3826-HCFA, April 1990. The FY 1987 to FY 1988 analysis is contained in Grace M. Carter, Joseph P. Newhouse and Daniel A. Relles, "Has DRG Creep Crept Up?: Decomposing the Case Mix Index Change Between 1987 and 1988," RAND Corporation, R-4098-HCFA/ProPAC, 1991.

12 Stuart H. Altman, "Measuring Real Case Mix Change Under Medicare's Prospective Payment System," p. 503.

3. Goldfarb and Coffey

Goldfarb and Coffey analyzed trends in the Medicare CMI over the period FY 1980 through FY 1986.[13] They found that real changes and upcoding were about equally important over this period, although the importance of the latter began to wane toward the end of the period. Among the real changes, the PPS appears to have induced substitution of surgical for medical care, greater use of new technologies, and improvements in coding accuracy. All of these phenomena led to assignment of cases to higher-weighted DRGs, thereby increasing hospital revenues. Like Ginsburg and Carter, they found no effects due to aging of the Medicare population, nor did they find any effects due to outpatient substitution for inpatient treatments.

4. Summary

Although upcoding may have been important for civilian hospitals during the PPS era, we do not believe that it is important for MTFs. Whereas MTF budgets were once determined by projected workload, since FY 1994 they have been "capitated" based on the size of the local beneficiary population. Therefore, if an incentive for MTFs to upcode ever existed, that incentive surely disappeared with the advent of capitated budgeting.

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13 Marsha G. Goldfarb and Rosanna M. Coffey, "Changes in the Medicare Case-Mix Index in the 1980s and the Effect of the Prospective Payment System," *Health Services Research*, Vol. 27, No. 3, August 1992, pp. 385-415.

VI. INTENSITY/TECHNOLOGY ESTIMATES FOR DOD DIRECT CARE

VI. INTENSITY/TECHNOLOGY ESTIMATES FOR DoD DIRECT CARE

This chapter develops estimates of the I&T factor for DoD direct care. The analytical methodology is discussed first. The MEPRS data, used to derive the estimates, are described next. Then findings are presented, followed by a discussion of their application to the DHP.

A. METHODOLOGY

Our approach is to decompose the drivers of year-to-year changes in the cost per discharge from military medical centers and community hospitals located in the continental United States (CONUS). Some of the cost drivers have already been identified and measured, such as pure price inflation. As we saw in Chapter IV, whether using either the current DHP algorithm or the proposed index substitutions, there is no single price index that applies throughout the entire DHP. However, we will be concerned mostly with direct-care *operating* costs, funded by the O&M and MilPers appropriations and tracked in MEPRS. The funding categories that most closely correspond to direct-care operating costs are DoD civilian pay (category 10) and non-labor, non-stock-funded costs (category 11), as displayed earlier in Table IV-1. These two funding categories are currently inflated by, respectively, the DoD civilian pay raise and a composite O&M rate dominated by the OSD Comptroller's index for O&M (excluding fuel and civilian pay). On the other hand, we have proposed using the HCFA hospital input-price index to inflate these two funding categories. Thus, we will measure I&T above a baseline given by the HCFA index.[1] If, in the future, a faster growing index than the HCFA index is used to inflate funding categories 10 and 11, the I&T estimates that we develop must be reduced point-for-point to avoid double-counting.

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1 An alternative would be to set the baseline equal to the weighted average of the indices actually used to inflate operating costs. We did not pursue this alternative because we did not have access to the Service budget justifications for the historical period studied (which began in FY 1989, 4 years prior to the DHP consolidation). In addition, as indicated in Table IV-1, the actual indices do not appear to differ substantially from the HCFA index.

Demographic trends have also been identified as a driver of cost per discharge. The ratio of weighted to unweighted MHSS users provides a measure of resource intensity. As shown earlier in Figure II-4, the year-to-year increase in this ratio—a measure of *increasing* resource intensity—has been positive over the late 1990s. Moreover, the latter increase is used to proportionally scale the capitation rate for Category 3 of the DHP. To the extent that I&T are already captured by this demographic adjustment to the capitation rate, an additional I&T factor is not necessary. Thus, again to avoid double-counting, we must deduct from our I&T estimates the demographic adjustment that is already being credited within the Capitation Model.

Finally, the Capitation Model contains a factor for UM, which acts to reduce the DHP funding requirement. Our I&T factor will be depressed to the extent that UM was already in place during our sample period. Further application of a UM factor would require the DHP to achieve UM savings twice, thereby leading to an understatement of the DHP funding requirement. To avoid this problem, we have restricted our sample to a period ending in FY 1995. Formal UM initiatives were in place at only a few selected MTFs during that period, and we have systematically deleted these MTFs from our sample. Thus, our I&T factor should be essentially free from this source of bias.

1. Expansion of Cost per Discharge

We take the following approach to estimate inpatient intensity, net of pure price inflation and demographic trends. First we consider the percentage change in HCFA-deflated cost per discharge, $\%\Delta\left(\text{Cost}_t/\text{Discharges}_t\right)$. Using data from two consecutive fiscal years, the percentage change may be calculated in various ways: the change in cost per discharge relative to the base-period value of the ratio, or the change in cost per discharge relative to the 2-year average of the ratio, etc. In fact, it is more convenient to calculate the percentage change using natural logarithms:

$$\begin{aligned}\ln\left[\frac{\left(\text{Cost}_{t+1}/\text{Discharges}_{t+1}\right)}{\left(\text{Cost}_t/\text{Discharges}_t\right)}\right] &= \ln\left(\frac{\text{Cost}_{t+1}}{\text{Discharges}_{t+1}}\right) - \ln\left(\frac{\text{Cost}_t}{\text{Discharges}_t}\right) \\ &= \ln\left(\frac{\text{Cost}_{t+1}}{\text{Cost}_t}\right) - \ln\left(\frac{\text{Discharges}_{t+1}}{\text{Discharges}_t}\right).\end{aligned} \tag{1}$$

The left-hand side of equation (1) is the logarithmic representation of the percentage change. We show in Appendix F that the logarithmic change is a second-order approximation to the percentage change measured relative to the 2-year average.

Moreover, the logarithmic representation enables the expansion shown in the right-hand side of equation (1). That is, the logarithmic change in cost per discharge may be expanded as the difference between the logarithmic change in cost and the logarithmic change in discharges.

2. Adjustment for Case Mix

A further refinement is available if we adjust the number of discharges for case mix. It is well known that different clinical procedures vary widely in resource intensity. Simply adding the total number of discharges, without regard to the procedures performed, would not yield a homogeneous work unit even for a single hospital. Moreover, it would be virtually impossible to compare unit costs across hospitals.

Our homogeneous work unit uses a weighting scheme for resource intensity based on DRGs. The DRG system uses medical diagnoses and surgical procedures to classify inpatient care into over 500 groups having roughly similar within-group resource requirements. DRGs form the basis for prospectively determining hospital payments under the Medicare and CHAMPUS programs. By following a DRG schedule, hospitals that treat the more resource-intensive cases are credited with larger payments. We have actually applied DRGs in a reverse fashion from their conventional usage. That is, we observe differences in unit costs across hospitals, and we have used DRGs to rationalize part of these differences.

The so-called Grouper software assigns a single DRG to each inpatient discharge from an MTF. This assignment is based on the inpatient record abstracts contained in each Service's Biometrics database, which may be retrieved from the Defense Medical Information System (DMIS) or its successor, the Corporate Executive Information System (CEIS). Specifically, the Grouper software assigns a DRG based on diagnoses, procedures performed, comorbidities and complications, and other factors. Because MTFs do not yet have a patient-level accounting system, it is not possible to directly estimate the average cost by DRG in MTFs. However, estimates of *relative* cost by DRG are available for an overlapping population, in the form of CHAMPUS reimbursement rates. We assume that relative payments by DRG under CHAMPUS provide a good proxy for (unobserved) relative cost by DRG in MTFs.

Table VI-1 presents a simplified, notional example to illustrate how DRG-based case-mix adjustment works. In this example, a vaginal delivery is accompanied by either a normal newborn or a low-birthweight newborn, yielding a total of two discharges. The

table demonstrates that the cost per discharge before case-mix adjustment ranges from $400 to $40,000. Because high-risk deliveries are typically identified in advance and referred to medical centers, a preponderance of low-birthweight infants are delivered in medical centers. Thus, before case-mix adjustment, one would expect a higher average cost per discharge at medical centers than at community hospitals.

Table VI-1. Derivation of DRG Weights (Notional)

DRG	Description	Total Cost	Total Discharges	Cost per Unadjusted Discharge	DRG Weight	Cost per DRG Weight
373	Vaginal Delivery	$14,240,000	5,000	$2,848	0.712	$4,000
391	Normal Newborn	$1,760,000	4,400	$400	0.100	$4,000
610	Low Birthweight Newborn	$24,000,000	600	$40,000	10.000	$4,000
	Total/Average:	$40,000,000	10,000	$4,000	1.000	$4,000

Continuing with this example, Table VI-1 compares average costs before and after case-mix adjustment. The DRG weight is computed in each row of the table as the ratio of cost per unadjusted discharge divided by the overall average cost (i.e., divided by $4,000). We see that average cost is equalized after application of the DRG weights, so that the cost and workload data at medical centers may be combined with the data from community hospitals, which are less likely to treat high-risk cases. For example, normal newborn care (DRG 391), most likely provided at a community hospital, is counted in our data as 0.100 weighted discharges. The average cost per *weighted* discharge equals $4,000. Low-birthweight neonatal care (DRG 610), most likely provided at a medical center, is counted in our data as 10.0 weighted discharges. The average cost per *weighted* discharge again equals $4,000.

By expressing workload in terms of weighted discharges, we have work units that are equally costly on average. Thus, the weighted discharges may be added to form a homogeneous predictor of total inpatient cost at any MTF. Weighted discharges are also known as relative weighted products (RWPs). Finally, the case-mix index is defined as the number of RWPs divided by the number of (unweighted) discharges. Note that the CMI may be computed for a particular MTF as well as system wide. In addition, the CMI may be separately computed by clinical area, beneficiary status, sex, or age group.

Equation (1) may be augmented to give a logarithmic representation of the percentage change in cost per *case-mix adjusted* discharge:

$$
\ln\left(\frac{\text{Cost}_{t+1}}{\text{Discharges}_{t+1} \times \text{CMI}_{t+1}}\right) - \ln\left(\frac{\text{Cost}_t}{\text{Discharges}_t \times \text{CMI}_t}\right)
$$

$$
= \ln\left(\frac{\text{Cost}_{t+1}}{\text{Cost}_t}\right) - \ln\left(\frac{\text{Discharges}_{t+1}}{\text{Discharges}_t}\right) - \ln\left(\frac{\text{CMI}_{t+1}}{\text{CMI}_t}\right). \tag{2}
$$

This expansion reveals that the logarithmic change in cost per discharge equals the difference between the respective logarithmic changes in cost, discharges, and the CMI.

3. Adjustment for Demographic Trends

The demographic trend in MHSS resource intensity was discussed in Chapter II. Figure VI-1, a modification of Figure II-4, shows the year-to-year increases in the ratio of weighted to unweighted MHSS users—a measure of *increasing* resource intensity. This quantity is used to proportionally scale the capitation rate for Category 3 of the DHP.

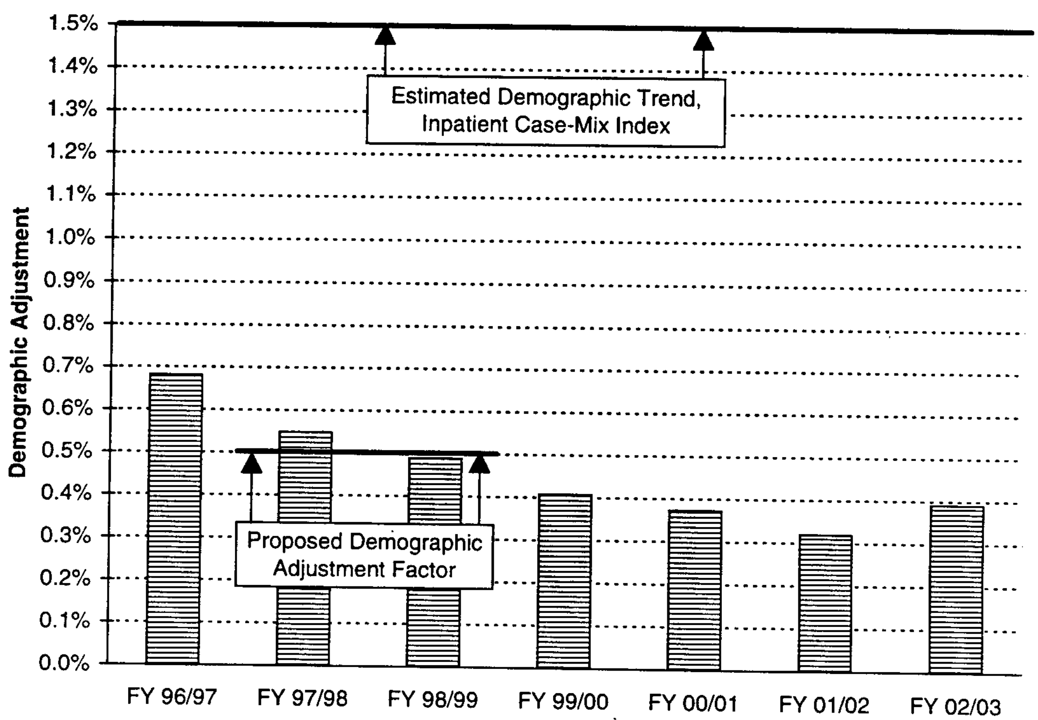

Figure VI-1. Proposed Demographic Adjustment Factor

To avoid double-counting, we must deduct from our I&T estimates the demographic adjustment that is already being credited within the Capitation Model via the age/sex adjustment. For the immediate short-term, FY 1997 through FY 1999, we

propose deducting the value 0.5% from our I&T estimates. The generally declining pattern in Figure VI-1 suggests that the age/sex adjustments will be smaller in the future; thus, the deduction from the I&T estimates should be smaller as well. As time progresses and the early 21st century RAPS projections become firmer, the moving average of the short-term age/sex adjustments should be used in place of the current deduction of 0.5%. For example, suppose that the RAPS projections for FY 1999 through FY 2001 hold firm and the age/sex adjustments indeed decline from 0.5% to 0.4%. In that case, the deduction from the I&T estimates should be lowered from 0.5% to 0.4%; i.e., the net I&T estimates should be increased by 0.1%.

We are implicitly assuming that the age/sex adjustment within the Capitation Model captures shifts in the distribution of DRGs, or the "across-DRG" effect. Our intent in estimating the I&T factor is to measure the change in cost per RWP, or the "within-DRG" effect. Some have argued that this approach is problematic, because "intensity" or "technology" may drive the distribution of DRGs as well as the cost per RWP. We hope to avoid this semantic conundrum by simply taking care that the demographic trend is counted *exactly once* between the age/sex adjustment and the I&T factor.

We have pursued an independent analysis of the demographic trend in the inpatient case-mix index. As reported in more detail below, we estimated an increase in the CMI of 1.5% per year due solely to demographic trends; this value is depicted as a solid horizontal line at the top of Figure VI-1. Our proposed short-term deduction from the I&T estimates, 0.5%, is only one-third as large. The two values are not completely comparable, because the latter is based on Bob Gold's resource weights. Those resource weights purport to reflect *total* MHSS utilization, including purchased care and outpatient direct care as well as inpatient direct care. In fact, Gold's estimate was not based entirely on MHSS data, but rather a combination of CHAMPUS experience for noncatchment areas and commercial HMO experience. Our estimate of 1.5% for inpatient direct care may or may not be consistent with Gold's estimate of 0.5% for total MHSS utilization. Absent evidence on this point, and in an effort to avoid double-counting, we have deducted the smaller value because it represents the age/sex adjustment that is *actually* applied to Category 3 of the DHP, not the amount that perhaps should be applied specifically to the inpatient direct care sector.

With this deduction, equation (2) is replaced by the following expression for the net I&T factor:

$$\ln\left(\frac{\text{Cost}_{t+1}}{\text{Cost}_t}\right) - \ln\left(\frac{\text{Discharges}_{t+1}}{\text{Discharges}_t}\right) - \ln\left(\frac{\text{CMI}_{t+1}}{\text{CMI}_t}\right) - 0.005. \tag{3}$$

To interpret expression (3), consider the following example. Suppose that the HCFA-deflated cost increased by 5% between two consecutive fiscal years, while the number of discharges increased by only 3%. Thus, the cost per discharge increased by 2%. Suppose also that the CMI declined from 1.00 to 0.97 over the same period. Then intensity must have increased by even more than 2%, because a putatively simpler case-mix (at least based on the relative costs observed under CHAMPUS) was actually more costly to treat. Finally, subtracting the 0.5% age/sex adjustment that is already applied in the Capitation Model, the net I&T factor turns out to be 4.5%:

$$\begin{aligned} \ln\left(\frac{\text{Cost}_{t+1}}{\text{Cost}_t}\right) - \ln\left(\frac{\text{Discharges}_{t+1}}{\text{Discharges}_t}\right) - \ln\left(\frac{\text{CMI}_{t+1}}{\text{CMI}_t}\right) - 0.005 &= \ln(1.05) - \ln(1.03) - \ln(0.97) - 0.005 \\ &= 0.050 - 0.030 + 0.030 - 0.005 \\ &= 0.045 \quad (4.5\%)\,. \end{aligned} \tag{4}$$

4. Weighting Across MTFs

We are interested in the growth rate of the aggregate cost per discharge throughout the entire direct-care system. Although this quantity could be modeled directly, we find it more enlightening to first model cost per discharge at each individual MTF, and then combine the MTF-level information to reflect the entire direct-care system. Our MTF-level modeling yields a separate I&T factor for each MTF in our sample. Examination of these individual factors gives us a sense of the dispersion in our estimates.

The question then remains of how to combine the MTF-level I&T factors to reflect the entire system. It would not be appropriate to compute a simple average of these factors, because that procedure would give equal weight to the smallest MTF (as measured by cost or workload) and the largest MTF. To develop a better procedure, let C_i denote deflated cost and let X_i denote case-mix adjusted workload at MTF i. Temporarily regarding time as a continuous variable, the growth rate in *aggregate* cost per unit workload may be obtained as a weighted average of the growth rates in cost and in workload at the individual MTFs:

$$
\begin{aligned}
\frac{d \ln}{dt}\left(\frac{\sum_i C_i}{\sum_i X_i}\right) &= \frac{d}{dt}\ln\left(\sum_i C_i\right) - \frac{d}{dt}\ln\left(\sum_i X_i\right) \\
&= \frac{\sum_i d\,C_i/dt}{\sum_i C_i} - \frac{\sum_i d\,X_i/dt}{\sum_i X_i} \\
&= \frac{\sum_i C_i\left(\frac{d\,C_i/dt}{C_i}\right)}{\sum_j C_j} - \frac{\sum_i X_i\left(\frac{d\,X_i/dt}{X_i}\right)}{\sum_j X_j} \\
&= \sum_i \left(C_i \Big/ \sum_j C_j\right)(d \ln C_i/dt) - \sum_i \left(X_i \Big/ \sum_j X_j\right)(d \ln X_i/dt).
\end{aligned}
\tag{5}
$$

We see that the individual growth rates in cost are weighted by the MTF cost shares, and the individual growth rates in workload are weighted by the MTF workload shares. Finally, as derived at the close of Appendix F, a discrete-time approximation to the right-hand side of equation (5) is obtained by substituting logarithmic ratios for logarithmic derivatives:

$$
\frac{d \ln}{dt}\left(\frac{\sum_i C_i}{\sum_i X_i}\right) \approx \sum_i \left(C_{i,t} \Big/ \sum_j C_{j,t}\right)\ln\left(C_{i,t+1}/C_{i,t}\right) - \sum_i \left(X_{i,t} \Big/ \sum_j X_{j,t}\right)\ln\left(X_{i,t+1}/X_{i,t}\right), \tag{6}
$$

where $C_{i,t}$ and $X_{i,t}$ denote cost and workload, respectively, at MTF i in year t. Our final I&T estimate is given by the value of equation (6), minus the age/sex adjustment of 0.5%.

We will pursue this approach in the next few sections by estimating the main ingredients required by equation (6): the MTF-level growth rates in deflated cost, $\ln\left(C_{i,t+1}/C_{i,t}\right)$, and in case-mix adjusted workload, $\ln\left(X_{i,t+1}/X_{i,t}\right)$.

B. DATA SET CONSTRUCTION

1. Data Sources

Table VI-2 gives the sources of the cost and workload data necessary for the I&T estimation. A break in the data sources occurred between FY 1993 and FY 1994, with the migration of the MEPRS data from the DMIS Summary System to MEPRS Central. We took considerable care to ensure that the data series were consistent over this transition period.

Table VI-2. Data Sources for Intensity/Technology Estimation

Variable	Fiscal Years	Table	Database
1. Non-psychiatric, non-partnership inpatient cost[a]	1989–1993	MEPRS4A	DMIS–Summary System/ MEPRS Module
	1994–1995	EXPENSE_SUMMARY	MEPRS_Central
2. Non-psychiatric, non-partnership inpatient dispositions[b]	1989–1993	MEPRS4A	DMIS–Summary System/ MEPRS Module
	1994–1995	R_W_WORKLOADS	MEPRS_Central
3. Non-psychiatric CMI[c]	1989–1995		Biometrics

a. When computing costs, all psychiatric workcenter expenses were excluded (for FY 1989–1993, UCA4_CD = 'AF%'; for FY 1994–1995, MEPRS4_CD = 'AF%'). Similarly, all Partnership accounts were excluded (for FY 1989–1993, UCA4_CD = '%P'; for FY 1994–1995, MEPRS4_CD = '%P').

b. Psychiatric and Partnership dispositions were excluded by a procedure analogous to that used for expenses. (For FY 1994–1995, SAS_ID and UNIT_OF_MEASURE_CD are both specified to indicate dispositions.)

c. Data obtained by special computer run from Vector Research, Inc.

We removed psychiatric workcenter expenses and dispositions from the database. Although psychiatric dispositions for mental health and substance abuse entail long lengths-of-stay, the treatments do not generally require high levels of technology and the major costs are often merely hotel services. By removing psychiatric dispositions from the database, we in effect assign zero intensity to this type of care. Having done so, we requested a special computer run from Vector Research, Inc., to compute the non-psychiatric CMI by MTF and fiscal year.

We also removed all dispositions associated with the Partnership program. Under this program, civilian physicians treat patients at MTFs but bill CHAMPUS for their services. Partnership workload is double-counted in both MEPRS and the CHAMPUS claims files. The professional fees charged by civilian physicians appear exactly once, in the CHAMPUS claims files. Conversely, MEPRS contains the costs of all ancillary services (e.g., laboratory, radiology, pharmacy) ordered by the civilian physicians and performed at the MTF. Because the professional fees are generally larger than the ancillary costs, the majority of Partnership costs are excluded from MEPRS. Thus, in order to avoid skewing the cost per disposition, we felt it necessary to remove the corresponding Partnership dispositions from the data.

2. Adjustments to MEPRS Data

It has long been recognized that the MEPRS expense data do not capture the full costs of providing peacetime medical care. To remedy this deficiency, an earlier IDA study examined the following six areas in which MEPRS potentially omits or understates costs:[2]

- OSD and Service medical management headquarters,
- facilities construction,
- central automation support,
- MEPRS Special Programs accounts,
- base operations and real property maintenance, and
- military personnel pay and allowances.

Some of these cost areas, such as medical management headquarters, are omitted from MEPRS by design because they are not funded by the hospital commander's budget. Understatement of cost may also arise from the use of standard cost factors. For example, physician full-time equivalents (FTEs) are priced at Service average rates that do not reflect the allowances and bonuses paid to medical personnel.

The understatement of cost proved significant in all but the final two areas listed above. Table VI-3 displays the factors that IDA derived from its "bottom-up" analysis of detailed Service data drawn from the period FY 1990 through FY 1992. These adjustment factors range between 10.6% and 16.9%.

Table VI-3. MEPRS Adjustment Factors from the Section 733 Study

	Adjustment Factor	
Service	Inpatient	Outpatient
Army	17%	13%
Navy	13%	11%
Air Force	13%	11%

If a constant percentage factor is applied to the MEPRS expense data across all fiscal years, then inclusion or exclusion of that factor has no effect on our estimates of the

2 Matthew S. Goldberg et al., "Cost Analysis of the Military Medical Care System: Final Report," Paper P-2990, Institute for Defense Analyses, September 1994, especially Chapter III.

year-to-year *growth rates* in cost. To see this point, let C represent reported cost, and let f represent a percentage adjustment factor to reported cost. Then the growth rates in reported cost and in adjusted cost are equal:

$$\frac{(1+f)C_1-(1+f)C_0}{(1+f)C_0} = \frac{C_1-C_0}{C_0}. \tag{7}$$

A complete reexamination of the MEPRS adjustment factors was not possible within the resources of the current study. Absent any evidence of non-constancy in the adjustment factors and given the invariance demonstrated in equation (7), we conducted our analyses in terms of unadjusted cost.

3. Sample Selection

The initial data sample contained all military medical centers and community hospitals in the CONUS. For various reasons, we deleted several MTFs from this initial sample. We first deleted all MTFs affected by Base Realignment and Closure (BRAC) during the sample period, FY 1989–FY 1995. We also deleted any MTF for which a BRAC action was *announced* during the sample period, even if the action would not actually begin until after the sample period (e.g., Fitzsimons Army Medical Center (AMC)). We took this step because it has been observed in the past that operations and, more important, data submission often become erratic at sites for which BRAC actions have merely been announced.

To avoid confounding I&T with utilization management, we deleted MTFs affected by major managed-care initiatives during the sample period. In particular, we deleted all of California and Hawaii because those two states came under the CHAMPUS Reform Initiative (CRI). We also deleted three MTFs that participated in the Tidewater TRICARE Demonstration:

- 1st Medical Group, Langley Air Force Base (AFB), Virginia (DMIS ID 120);
- McDonald Army Community Hospital (ACH), Ft. Eustis, Virginia (DMIS ID 121);
- Naval Hospital (NH) Portsmouth, Virginia(DMIS ID 124).

Finally, we deleted three MTFs that exhibited erratic data patterns, perhaps due to reporting anomalies:

- 314th Medical Group, Little Rock AFB, Arizona (DMIS ID 13);
- 27th Medical Group, Cannon AFB, New Mexico (DMIS ID 85);
- 4th Medical Group, Seymour Johnson AFB, North Carolina (DMIS ID 90).

Appendix G lists the names, locations, and Service affiliations of the 75 MTFs that comprise the final data sample. We have classified each MTF as either a small community hospital, a large community hospital, or a medical center. We define a small community hospital as one for which the average number of operating beds over the sample period was less than 75.

After the various deletions, only 11 of the 15 DoD medical centers remain in the final data sample:

- William Beaumont AMC;
- National Naval Medical Center (NNMC), Bethesda;
- Brooke AMC;
- Eisenhower AMC;
- Medical Center, Keesler AFB;
- Madigan AMC;
- Malcolm Grow USAF Medical Center;
- Walter Reed AMC;
- Medical Center, Scott AFB;
- Wilford Hall USAF Medical Center; and
- Medical Center, Wright-Patterson AFB.

NH Portsmouth was deleted because it participated in the Tidewater TRICARE Demonstration and three medical centers were deleted because of CRI: David Grant USAF Medical Center, NH San Diego, and Tripler AMC. Note that NNMC Bethesda is the only included Navy medical center.

4. Summary Statistics

Appendix H provides summary statistics for the 75 MTFs included in the I&T analysis sample. Figure VI-2 displays the trends in case-mix index by hospital type. The CMI is generally about 40 percentage points higher in medical centers than in community hospitals. The CMI declined between FY 1990 and FY 1991, most prominently at medical centers where the average decline was 9 percentage points. We will present evidence below that the decline was largely due to definitional changes in the DRG

Grouper software. Since that time, the CMI has increased somewhat at both medical centers and small community hospitals, though not at large community hospitals.

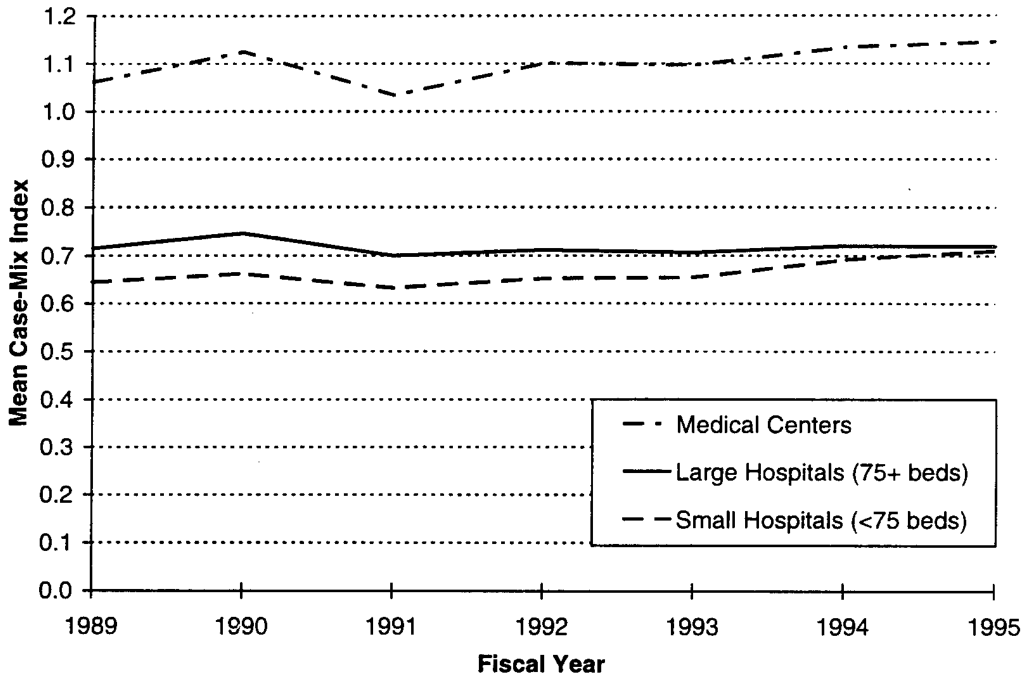

Figure VI-2. Trends in Case-Mix Index by Hospital Type

C. FINDINGS

1. CMI Trend Analysis

As already mentioned, we pursued an independent analysis of the demographic trend in the inpatient CMI. Specifically, we used regression analysis to decompose the trend in the CMI into demographic and structural effects. The demographic effect reflects changes in the mix of patients treated across eight age/sex cells. We obtained our age intervals by collapsing the intervals available in the Retrospective Case-Mix Analysis System (RCMAS).[3] The available age intervals are 0–4, 5–14, 15–17, 18–24, 25–34, 35–44, 45–64, and 65+; the intervals that we used are 0–17, 18–44, 45–64, and 65+. The latter four intervals should suffice to estimate the drift in the CMI that is already captured

3 "Retrospective Case-Mix Analysis System for an Open System Environment (RCMAS-OSE): Users Manual," Office of the Assistant Secretary of Defense (Health Affairs), Defense Medical Systems Support Center (DMSSC), October 1993.

by the age/sex adjustment in the Capitation Model. Although it may be possible to improve the prediction of the CMI by including additional regressors, we did not do so. Our objective was not to optimize the prediction of the CMI; rather, it was to measure the degree to which trends in the CMI can be predicted by changes in the demographic mix of patients treated.

The structural effect reflects changes in the CMI that would have occurred even if the demographic mix of patients had remained constant. One source of the structural effect is the annual update in the DRG Grouper software. We will cite evidence below which indicates that DRG Grouper updates could conceivably lead to considerable CMI drift even for an *identical* set of discharges. The structural effect also embodies changes in medical practice, policy, and care patterns which cause discharges to vary over time in resource intensity.

We separated the demographic and structural effects by first estimating the following set of regression equations:

$$\mathrm{CMI}_t = \sum_{i=1}^{8} b_{it}\, X_{it}\,, \tag{8}$$

where t denotes a particular fiscal year, i indexes the eight age/sex cells, X_{it} denotes the share of discharges due to patients in the i^{th} age/sex cell, and b_{it} is a regression parameter. We estimated equation (8) separately for each of FY 1990 through FY 1994 using cross-sectional data on 73 MTFs.[4] The regression parameters may be found in Appendix I.

We then considered the following algebraic identity:

$$\mathrm{CMI}_{t+1} - \mathrm{CMI}_t = \sum_{i=1}^{8}\left[\left(b_{i,t+1} - b_{it}\right)\times X_{i,t+1}\right] + \sum_{i=1}^{8}\left[b_{it}\times\left(X_{i,t+1} - X_{it}\right)\right]. \tag{9}$$

The first term on the right-hand side of equation (9) measures the structural effect (i.e., the change in the CMI for fixed demographics). The second term on the right-hand side measures the demographic effect (i.e., the change in the CMI for a fixed DRG Grouper). We estimated these effects in the aggregate by averaging the first and second terms,

4 Two MTFs, though included in the later intensity analysis, were excluded from the CMI regressions because data on age/sex shares were missing for at least on fiscal year: 554th Medical Group, Nellis AFB (DMIS ID 79), and Naval Hospital Millington (DMIS ID 107).

respectively, over the 73 MTFs. We repeated this entire procedure for each pair of successive fiscal years in the range FY 1990 through FY 1994.

Figure VI-3 displays the estimated structural and demographic effects. Our primary interest is in the latter, because our objective is to avoid double-counting the CMI drift that is already captured by the age/sex adjustment in the Capitation Model. The demographic effect is relatively stable over the period analyzed, with a mean value of 0.013. Because the average value of the CMI over the period is 0.861, this increase of 1.3 *percentage points* per year translates into an increase of 1.5 *percent* per year relative to the base CMI.

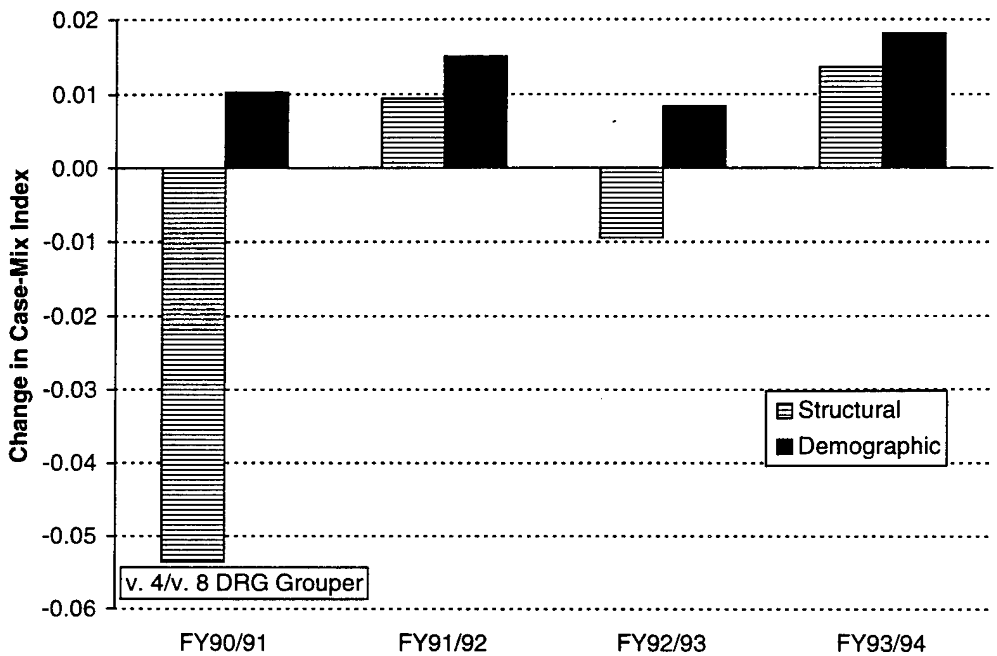

Figure VI-3. Estimated Structural and Demographic Effects

Although the structural effects are of lesser intrinsic interest, the rather large structural decline of 0.0535 between FY 1990 and FY 1991 demands some explanation. This decline was most likely due to the radical update in the DRG Grouper. Between FY 1987 and FY 1990, inclusive, DRG weights were assigned using the Version 4 (FY 1987) CHAMPUS DRG Grouper. DRG weights for FY 1991 were assigned using the Version 8 (FY 1991) CHAMPUS DRG Grouper. Since that time, the DRG Grouper

used in MTFs had been updated annually to correspond to the most recent CHAMPUS Grouper.[5] Thus the one-time jump of four version numbers has never been repeated.

Vector Research, Inc. (VRI) performed a prospective analysis of the likely effects of the one-time jump in the CHAMPUS Grouper.[6] They extracted a sample of FY 1990 discharges to which DRGs had already been assigned using the Version 4 (FY 1987) Grouper. They then assigned new DRGs to the *same* discharges using the Version 8 (FY 1991) Grouper. After removing all discharges for mental health, psychiatric care, and substance-abuse care, their estimates indicate a decline in the CMI from 0.8432 to 0.8113, a difference of 0.0319. VRI's analysis provides a pure estimate of the effect of changing the DRG Grouper, because exactly the same discharges were grouped in each year, so that medical practice, policy, and care patterns were all held constant. Our estimate of the structural decline in the CMI is slightly larger, 0.0535. Our estimate may reflect other factors that were at play during Operation Desert Storm. For example, MTFs may have shifted some of their effort toward pre-deployment physical examinations at the expense of complex surgeries.

As already mentioned, to avoid double-counting the age/sex adjustment in the Capitation Model, we will deduct only the factor that is *actually* applied to Category 3 of the DHP (0.5%), not the larger factor that is suggested by our independent analysis of CMI trends (the 1.5% demographic drift).

2. Intensity/Technology Estimates

Figure VI-4 presents the I&T estimates by size class and fiscal year. Recall that these estimates are

- measured above a baseline given by the HCFA hospital input-price index,
- adjusted by a demographic trend of 0.5% per year, and
- weighted across MTFs within the three size classes.

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5 CHAMPUS Version 8 (FY 1991) DRG weights were published in the *Federal Register*, Vol. 55, No. 214, November 5, 1990, pp. 46,547-46,557. Annual updates appear around the same time of year in each volume of the *Federal Register.*

6 K. Dombkowski and James Lee, "Development and Impact of Implementing FY91 (Version 8) CHAMPUS DRG Weights and Outlier Criteria," Vector Research, Inc., Ann Arbor, Mich., VRI-DMIS-2.60 WP92-5, May 1992, especially Exhibit 1-6.

Each bar in Figure VI-4 represents a weighted average among either 11 medical centers, 17 large community hospitals, or 47 small community hospitals. The individual variation that underlies these weighted averages is displayed in Appendix J.

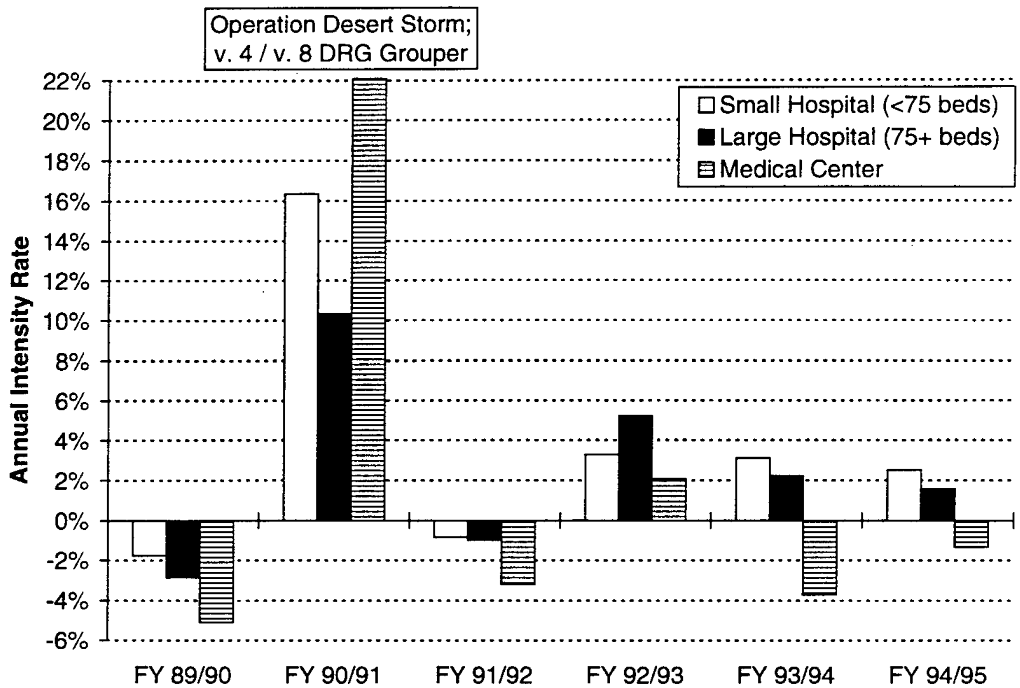

Figure VI-4. Intensity/Technology Estimates by Size Class and Fiscal Year

One striking feature of Figure VI-4 is the large set of estimates for FY 1990 and FY 1991. As already indicated, definitional changes in the DRG Grouper software led to a structural decline in the CMI of over five percentage points. Because the CMI appears in the denominator of the cost per case-mix adjusted discharge, the structural decline in the CMI automatically leads to an overstatement of I&T (compare equation (2)). In addition, the disruption caused by Operation Desert Storm renders this pair of years irrelevant for studying normal peacetime medical care. In the subsequent discussion, we will avoid this period and restrict our attention instead on the four sets of estimates over the period FY 1991 to FY 1995.

Having made this restriction, the most striking remaining feature of Figure VI-4 is the negative set of estimates for medical centers. The simple time-average over the period FY 1991 to FY 1995 is +2.0% for small hospitals, +2.0% for large hospitals, but –1.5% for medical centers. Additional detail on the 11 medical centers is shown in Figure VI-5. Eisenhower AMC is clearly an outlier, consistent with known data-reporting

problems at that facility. Recognizing these problems, we excluded Eisenhower AMC from the computations underlying both Figure VI-4 and the time-average of –1.5%. Figure VI-5 arrays the medical centers from largest (Walter Reed AMC) to smallest (Scott AFB) in terms of average annual inpatient cost over the period FY 1991 to FY 1995. Excluding Eisenhower AMC, we see a negative correlation between size and the estimated I&T rate (rank correlation = 0.50). In fact, while the two medical centers in San Antonio (Wilford Hall and Brooke AMC) have marginally positive I&T rates, the only large positive rates are found among two of the smallest medical centers (Wright-Patterson AFB and Scott AFB).

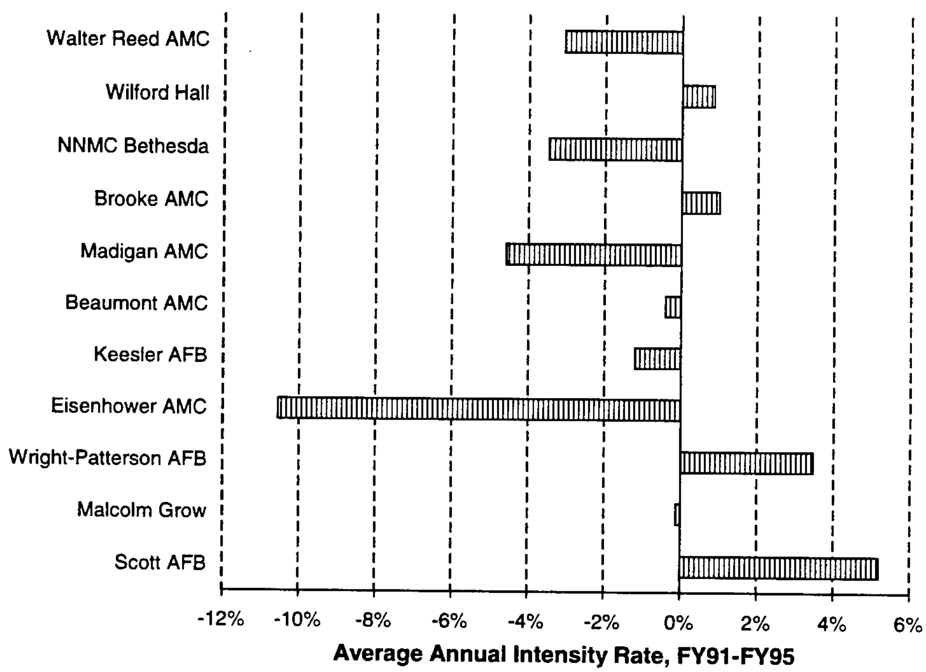

Figure VI-5. Intensity/Technology Estimates for DoD Medical Centers

DoD medical centers receive 37% of the total direct-care funding.[7] The weighted average of the medical-center I&T rate (–1.5%) and the community-hospital I&T rate (+2.0%) is +0.7%. We consider this value our best estimate of the overall I&T rate for non-psychiatric inpatient direct care.

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7 Relative to the sum of program elements 0807711 (Care in Regional Defense Facilities) and 0807792 (Station Hospitals & Medical Clinics), the former received 36.9% of the appropriations for FY 1993 and 36.8% of the appropriations for FY 1994. Note that the program element structure subsequently changed so that medical centers were consolidated with station hospitals and clinics.

We also examined one excursion from our best estimate. An agnostic view might dismiss the negative I&T rate for medical centers, and replace it with the value of zero. Under this view, cost per case-mix adjusted discharge has exactly kept up with the sum of the growth rate in the HCFA hospital input-price index, plus the demographic trend of 0.5% per year. Replacing the medical-center I&T rate of –1.5% with the value of zero leads to a new weighted average of +1.3%. We consider this value an upper bound on the overall I&T rate for non-psychiatric inpatient direct care.

D. APPLICATION TO THE DHP

1. Inpatient Care

It remains to compute the dollar impact of the I&T estimates. We first identified two collections of PEs that we label "Direct Care" and "Support," respectively. These PEs, displayed in Table VI-4, were selected after carefully studying the FYDP, the DHP budget justification, and the Advanced Mission Oriented Resource Display (AMORD). The "Direct Care" and "Support" PEs received FY 1996 appropriations of $6.5 billion and $1.1 billion, respectively, totaling $7.6 billion, or virtually half of the $15.5 billion in the DHP.[8]

Our intent in selecting these PEs was to capture all of the costs that are subject to increases due to I&T. Our I&T estimates are based on MEPRS data which, as acknowledged earlier in this chapter, do not capture the full costs of providing peacetime medical care. Procurement costs, for example, are not only excluded from MEPRS, but are also likely to increase along with MEPRS operating costs in response to I&T. By including procurement costs in the "Support" category, we are actually assuming that these costs will increase *in the same proportion* as MEPRS operating costs. On the other hand, we have excluded the costs of Visual Information Activities (PE 0807790), Defense Medical Program Activity (DMPA, PE 0807791), Base Communications (PEs 0807795/0807995), Base Operations (PEs 0807796/0807996), and Management Headquarters (PE 0807798). Although these costs are essential to a full accounting of

8 The partitioning of three PEs into CONUS and OCONUS (outside the continental United States) first occurred in FY 1996; contrary to convention, the DHP defines "CONUS" to *include* Alaska and Hawaii. For the period actually studied, FY 1989 through FY 1995, these three PEs were still consolidated world-wide. We list both the CONUS and OCONUS PEs in the table so that the funding totals will be commensurable with the earlier years (i.e., roughly $7.6 billion for Direct Care plus Support, world-wide).

Table VI-4. FY 1996 Program Elements for Direct Care and Support

Program Element	Description	FY 1996 Appropriation Levels (millions of dollars)				
		Military Personnel	Operations and Maintenance	Military Construction	Procurement	Total
	Direct Care:					
0807700	Defense medical centers, station hospitals and clinics, CONUS	2,831.9	2,954.6			5,786.5
0807900	Defense medical centers, station hospitals and clinics, OCONUS	439.2	288.6			727.7
	Subtotal:	3,271.0	3,243.2	0.0	0.0	**6,514.2**
	Support:					
0807716	Medical facilities—planning and design			9.5		9.5
0807717	Medical facilities—military construction			186.9		186.9
0807720	Other procurement, construction/initial outfitting				7.7	7.7
0807721	Other procurement, replacement/modernization				278.9	278.9
0807776	Minor construction—CONUS		52.6			52.6
0807778	Maintenance and repair—CONUS	0.4	302.7			303.1
0807779	Real property service—CONUS	0.0	183.3			183.3
0807976	Minor construction—OCONUS		7.2			7.2
0807978	Maintenance and repair—OCONUS		76.0			76.0
0807979	Real property service—OCONUS		19.3			
	Subtotal:	0.5	641.1	196.4	286.6	**1,105.2**
	Total:	3,271.5	3,884.2	196.4	286.6	**7,619.4**
	Percent of total:	42.9%	51.0%	2.6%	3.8%	100.0%

peacetime medical care, we do not believe that they will increase to any significant degree in response to I&T.

Figure VI-6 shows the domain of application for our I&T estimates. The pie chart divides the DHP into Direct Care, Support, Purchased Care (i.e., CHAMPUS, TRICARE MCS contracts, supplemental care, and the USTFs), and Other DHP. The shaded area to the right of the vertical line depicts the $7.6 billion, or half of the DHP, in Direct Care and Support. Our I&T estimates apply at most to this half only. The bar chart further divides the $7.6 billion based on the historical MEPRS proportions in non-psychiatric inpatient care, psychiatric inpatient care, and outpatient care. The most direct application of our I&T estimates is to the $3.0 billion in non-psychiatric inpatient care. Our best estimate of +0.7, when applied to this base, yields a funding increment of $21 million for FY 1996. Our upper bound estimate of +1.3%, when applied to the same base, yields a funding increment of $39 million.

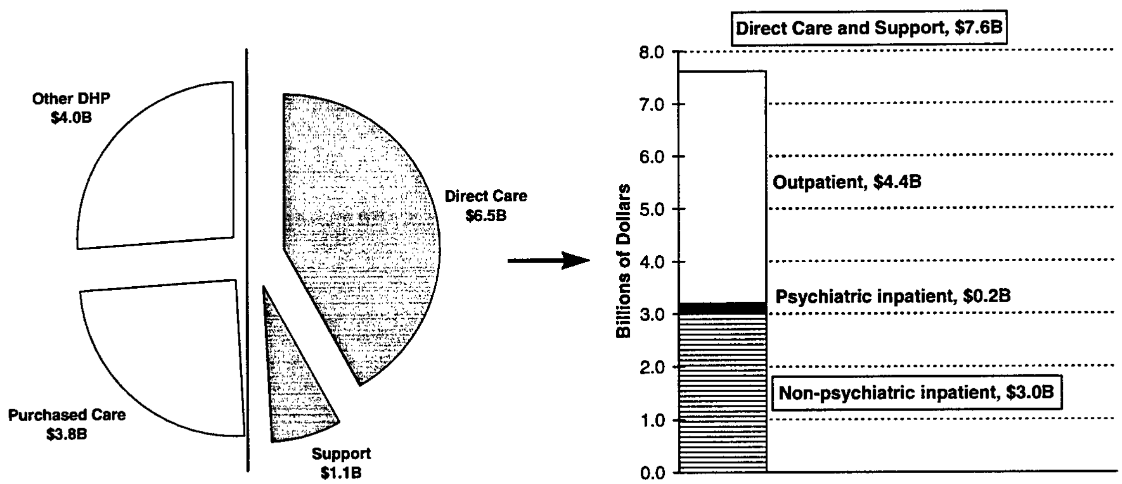

Figure VI-6. Domain of Application for Intensity/Technology Estimates

2. Outpatient Care

We have thus far restricted our discussion to non-psychiatric inpatient direct care. Pending full implementation of the Ambulatory Data System (ADS), current DoD data systems do not support a parallel analysis of outpatient direct care. Therefore, we must garner from the civilian sector any information on the relationship between the inpatient and outpatient I&T factors.

The only study we have been able to identify that addresses this issue is Cromwell and Beaven.[9] Recall from Chapter V that for the period 1984 through 1990, they estimated inpatient and outpatient intensity rates of 4.4% and 5.6%, respectively. Because of differences between the military and civilian sectors, as well as differences in methodology between our study and theirs, we do not recommend an outpatient intensity factor in excess of the inpatient intensity factor. However, pending a future analysis of ADS data, our best estimate is to extrapolate the +0.7% inpatient factor to the outpatient sector as well. This estimate, when applied to the base of $4.4 billion displayed earlier in Figure VI-6, yields a funding increment of $31 million for FY 1996. Thus, the total funding increment, including both inpatient and outpatient care, is $52 million.[10]

3. Overlap Between Intensity/Technology and the CPI–M

We argued in Chapter IV that the CPI–M embodies I&T, and is therefore upward biased as a measure of pure price inflation. Nonetheless, we maintained that the CPI–M is appropriate for inflating the following funding categories within the DHP:

- Supplemental Care,
- USTFs,
- Direct Patient Care (in the Other Contracts object class), and
- Patient Care Support (in the Other Contracts object class).

The CPI–M is appropriate because these funding categories represent direct purchases of medical outputs from the civilian economy. If these medical outputs contain increasing levels of I&T, then DoD is compelled to pay correspondingly higher prices. The CPI–M captures both the pure inflation and the I&T levels that drive these higher prices.

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9 Jerry Cromwell and Meredith Beaven, "Decomposition of the Health Care Spending Residual."

10 The inpatient and outpatient bases of $3.0 billion and $4.4 billion are somewhat larger than the corresponding MEPRS accounts. We could not make this comparison for FY 1996 because the MEPRS data for that year were not yet final as of this writing. In FY 1994, however, world-wide MEPRS inpatient ("A" account) and outpatient ("B" account) expenses were $2.65 billion and $3.95 billion, respectively. The sum of those two values, $6.60 billion, fell short of total appropriations, $7.17 billion, in the FY 1994 counterparts to the program elements shown in Table VI-4. Notwithstanding the conceptual distinction between expenses and appropriations, the latter, larger number is the appropriate basis because it includes procurement, military construction, and other costs that we believe will increase in the same proportion as MEPRS operating costs in response to intensity and technology.

If I&T are already being credited to certain funding categories via the CPI–M, then those funding categories should not receive the additional I&T factor estimated in this chapter. Table VI-5 addresses the degree of overlap between the CPI–M funding categories and the program elements to which we propose applying the I&T factor (the latter were listed earlier in Table VI-4). Funding categories 4 through 6 map into program elements that are disjoint from those listed in Table VI-4. The CPI–M is applied to these funding categories but the I&T factor is not, hence there is no overlap.

The only overlap occurs within funding category 3, Direct Patient Care (Other Contracts). This funding category contained $495 million in FY 1995. Using an I&T factor of 0.7%, Direct Patient Care (Other Contracts) contributes $3.5 million to the overall funding increment of $52 million for inpatient and outpatient care. To the limited extent that the BLS is successful in purging I&T from the CPI–M, I&T are counted exactly once in the 0.7% factor but only fractionally in the CPI–M. Thus, the $3.5 million figure represents an upper bound on the overlap between the 0.7% I&T factor and the CPI–M. Moreover, the overlap will likely decline in the future as the BLS improves its procedures for computing the CPI–M. Finally, the $3.5 million overlap is roughly offset by our $2.5 million understatement of the DHP pharmaceutical requirement when using the HCFA index, as acknowledged in Chapter IV. If we treat these errors as counterbalancing, then both our recommended price indices (including selected retention of the CPI–M) and our I&T factor may be used without modification.

4. Validity and Relevance Under TRICARE

As explained earlier, we deliberately deleted from the sample those MTFs affected by CRI and the Tidewater TRICARE Demonstration. Our intent in doing so was to obtain a pure, "pre-TRICARE" analysis of I&T. However, it is important to reflect on the validity and relevance of our I&T estimates in light of the ongoing transition to TRICARE.

Our I&T estimates are based on the growth rate of the cost per discharge, net of various adjustments described in this chapter. Although the only studies that we were able to identify are several years old, there is no evidence of differential growth rates of cost under civilian managed care versus traditional health care. In their literature review, Miller and Luft state that:

Table VI-5. Mapping Between Funding Categories and Program Elements

Funding Category	Sub-Activity Group	Object Class Number	Object Class Description	Program Element Number	Program Element Description
3. Direct patient care, other contracts	Direct patient care	989	Other contracts	0807700	Defense medical centers, station hospitals and clinics, CONUS
4. Supplemental care	Care in non-defense facilities	989	Other contracts	0807713	Care in non-defense facilities
5. USTFs	Care in non-defense facilities	998	Other costs	0807713	Care in non-defense facilities
6. Patient care support, other contracts	Patient care support	989	Other contracts	0807705 0807760	Military public and occupational health Veterinary services

> Recent peer-reviewed literature did not produce estimates of three other central summary indicators of managed care plan performance: the rate of growth of expenditures, and the level and rate of growth of premiums. As a result, we do not yet know if the rate of growth in expenditures or premiums has been similar in HMO and indemnity plans, as two studies concluded based on the analysis of limited data prior to 1982.[11]

One of the studies cited by Miller and Luft states the following:

> It is well known that the costs of care at health maintenance organizations (HMOs) at any point in time have been lower than in the fee-for-service sector, but how costs have changed in each of these sectors has been less well documented. The only previous study, which examined the HMO experience during the 1960s and early 1970s, found that HMO and fee-for-service costs rose at approximately the same rate. The present study, which extends this analysis to the period 1976-1981, also demonstrates that HMO costs increased at a rate not detectably different from that in the fee-for-service sector. These results are consistent with the earlier conclusions that HMOs cause a once-and-for-all reduction in cost.[12]

We have also identified one study, by Penner, that compares growth rates of cost within DoD. Penner examined the Catchment Area Management (CAM) program at Evans ACH, Ft. Carson, Colorado. Under CAM, the local hospital commander is given control over CHAMPUS funds within the catchment area as well as direct-care O&M. This arrangement provides the hospital commander with incentives to coordinate direct and purchased care in the best way possible, because any realized savings can be used to provide additional services for the catchment area. Penner compared the first 4 years (1988-1991) of performance under CAM with the U.S. Air Force Academy hospital at Colorado Springs, a nearby control site with an overlapping catchment area. Penner found that over the period studied, cost per direct-care admission showed a cumulative increase of 30.2% at the U.S. Air Force Academy hospital, versus only 15.1% at Evans ACH.[13] Thus, contrary to the civilian literature, there does appear to be some evidence

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[11] Robert H. Miller and Harold S. Luft, "Managed Care Plan Performance Since 1980: A Literature Analysis," *Journal of the American Medical Association*, Vol. 271, No. 19, May 18, 1994, p. 1517.

[12] Joseph P. Newhouse, W.B. Schwartz, A.P. Williams and C. Witsberger, "Are Fee-for-Service Costs Increasing Faster Than HMO Costs?" *Medical Care*, Vol. 28, 1985. The other study cited by Miller and Luft is Harold S. Luft, "Trends in Medical Care Costs: Do HMOs Lower the Rate of Growth?" *Medical Care*, Vol. 18, 1980.

[13] Jerome Penner, "A Study to Determine the Effectiveness of the Catchment Area Management Project at Evans U.S. Army Community Hospital to Contain Health Care Costs," Masters Thesis, U.S. Army–Baylor University Graduate Program in Health Care Administration, December 1992. The results cited in the text are found in Tables 6 and 7, pp. 59-60.

that growth rates of cost are slower under managed care. However, we do not view Penner's study as definitive because it was based on only 4 years of data from two MTFs.

In either case, because we systematically deleted from our sample those MTFs affected by formal UM initiatives, our I&T estimates should be essentially free of UM effects. We would encourage a reexamination of the I&T–UM nexus once data from the TRICARE period become available.

VII. CONCLUSIONS AND RECOMMENDATIONS

VII. CONCLUSIONS AND RECOMMENDATIONS

In this paper we have evaluated the inflation indices used in constructing the DHP budget requirement and developed estimates of an I&T factor that drives additional funding growth. On the first issue, we reviewed the variety of inflation indices currently in use, including the CPI subindex for medical care (CPI–M), the DoD civilian pay raise, the OSD Comptroller's O&M inflator, and the DoD stock-fund reconciliation rates. We also investigated two indices from the civilian medical sector: the HCFA hospital input-price index and the PPI for Surgical and Medical Instruments and Apparatus. We believe that the two indices from the civilian medical sector are theoretically more appropriate than the indices currently in use for inflating certain portions of the DHP O&M appropriation. For example, the HCFA index is oriented toward input prices facing hospitals, whereas the CPI–M is oriented toward consumers' out-of-pocket medical expenses. Moreover, the recent Boskin Commission concluded that the CPI–M is upward biased because it is based primarily on list prices rather than transaction prices and because it does not adequately separate pure inflation from improvements in the quality of medical care.

We estimated the impact on the DHP budget if the alternative inflation indices had been applied in two historical years. When inflating the FY 1994 O&M base to FY 1995, the alternative indices would have resulted in a funding decrement of $6 million. When inflating the FY 1995 O&M base to FY 1996, the funding decrement would have been $5 million. It is tempting to dismiss these quantities, which represent only about 0.06% of the total O&M dollars in the DHP. However, the small magnitudes are largely due to fortuitously offsetting effects when the CPI–M is replaced by slower growing indices and certain other indices simultaneously are replaced by faster growing indices. In fact, the BLS has acknowledged an upward bias in the CPI–M growth rate and is currently investigating technical improvements that would decelerate the growth of that index. Thus, the historical offsets might not continue into the future, and continued use of the CPI–M might actually understate the DHP budget requirement. To guard against this hazard, we recommend that the alternative indices be implemented when constructing the DHP budget requirement.

Our second issue is estimation of an I&T factor. This factor represents additional funding growth over and above inflation, demographic, and other adjustments already applied under current DHP methodology. Concentrating first on inpatient direct care, we estimated the I&T factor by decomposing the drivers of year-to-year changes in the cost per discharge from CONUS MTFs. Our data sample includes direct-care operating costs funded by the O&M and Military Personnel appropriations and tracked in MEPRS. We applied the resulting I&T factor, however, to a somewhat larger base of $3.0 billion. This base includes the non-psychiatric inpatient share of a collection of program elements that we believe will increase in the same proportion as MEPRS operating costs in response to I&T. In particular, the base includes roughly $300 million in Procurement funding and $500 million in O&M-funded installation support. These program elements are disjoint from the ones where we recommend retaining the CPI–M, so that there is no overlap between the I&T already embedded in the CPI–M and our explicit I&T factor.

Current data systems do not support a parallel analysis of outpatient direct care. Based on some studies of the civilian medical sector, it appears that outpatient intensity is roughly equal in magnitude to inpatient intensity. Therefore, we provisionally recommend that our I&T factor be applied to the entire direct-care base (inpatient plus outpatient) of $7.4 billion in the specified program elements. Our best estimate of the I&T factor, 0.7% per year, when applied to this base yields a funding increment of $52 million for FY 1996. We also recommend that an explicit I&T factor for outpatient direct care be estimated when the necessary data systems become operational.

Our I&T factor was estimated relative to a baseline given by the HCFA hospital input-price index. This estimate remains valid if either the HCFA index is substituted for certain other indices currently used to inflate the DHP budget requirement (as we recommend), or if the current indices remain in use but maintain their historical relationship to the HCFA index. On the other hand, if a faster-growing index than the HCFA index is used to inflate the budget, then to avoid double-counting, the I&T factor must be reduced point-for-point. Conversely, if a slower-growing index is used (e.g., a decelerated version of the CPI–M), then the I&T factor must be correspondingly increased. To avoid this recurring calibration problem, we consider it advisable that both of our recommendations be implemented simultaneously; that is, adopt the HCFA index in conjunction with an I&T factor estimated relative to that index.

APPENDIX A: CIVILIAN AND MILITARY PRICE INDICES, 1990-1996

APPENDIX A: CIVILIAN AND MILITARY PRICE INDICES, 1990–1996

This appendix gives the civilian and military price indices used throughout the report. All indices are normalized to the base year of 1990.

The data sources are the following:

CPI–U: The series that we used is the Consumer Price Index–All Urban Consumers (CPI–U), all items, not seasonally adjusted, U.S. city average, Series ID CUUR0000SA0. This series is available at the Bureau of Labor Statistics web site, http://stats.bls.gov/cgi-bin/surveymost.

CPI–M: The series that we used is the Consumer Price Index–All Urban Consumers, *medical care* (CPI–M), not seasonally adjusted, U.S. city average, Series ID CUUR0000SA5. This series is available by specifying the Series ID at the following web site: http://stats.bls.gov/cgi-bin/srgate.

HCFA: The HCFA hospital input-price index is available at the following web site: http://www.hcfa.gov/stats/TB10962.TXT.

MEI: The Medicare Economic Index available at the following web site: http://www.hcfa.gov/stats/TB13962.TXT.

PPI: The series that we used are the PPI for General Medical and Surgical Hospitals, not seasonally adjusted, Series ID PCU8062#; the PPI for Surgical and Medical Instruments and Apparatus, except Furniture, Series ID PCU3841#1; and the PPI for Pharmaceutical Preparations, Series ID PCU2834#. These series are available at the BLS web site, http://stats.bls.gov/cgi-bin/surveymost. Full series descriptions are found in U.S. Office of Management and Budget, *Standard Industrial Classification Manual—1987*, Washington, D.C., 1987.

DoD: The DoD outlay deflators are taken from "National Defense Budget Estimates for FY 1998," Department of Defense, Office of the Undersecretary of Defense (Comptroller), March 1997. The deflator for Military Personnel appears in Table 5–8; the deflator for O&M excluding fuel and civilian pay appears in Table 5–9.

Table A-1. Civilian and Military Price Indices

			Civilian Indices							Military Indices	
Year	Quarter	Month	CPI-U	CPI-M	HCFA Hospital Input-Price Index	Medicare Economic Index	PPI[a] SIC 8062	PPI SIC 3841	PPI SIC 2834	Military Personnel	O&M[b]
1990		January	1.000	1.000				1.000	1.000		
	C1	February	1.005	1.010	1.000	1.000		0.998	1.011		
		March	1.010	1.018				1.002	1.018		
		April	1.012	1.025				1.006	1.025	1.000	1.000
	C2	May	1.014	1.031	1.009	1.009		1.009	1.030		
		June	1.020	1.038				1.010	1.028		
		July	1.024	1.049				1.009	1.033		
	C3	August	1.033	1.058	1.023	1.017		1.011	1.039		
		September	1.042	1.064				1.012	1.039		
		October	1.048	1.072				1.014	1.047		
	C4	November	1.050	1.080	1.037	1.025		1.014	1.056		
		December	1.050	1.085				1.012	1.058		
1991		January	1.057	1.097				1.017	1.064		
	C1	February	1.058	1.106	1.043	1.033		1.015	1.074		
		March	1.060	1.114				1.020	1.078		
		April	1.061	1.119				1.021	1.094	1.046	1.043
	C2	May	1.064	1.124	1.049	1.040		1.024	1.097		
		June	1.068	1.130				1.025	1.101		
		July	1.069	1.139				1.025	1.113		
	C3	August	1.072	1.148	1.060	1.047		1.026	1.118		
		September	1.077	1.153				1.028	1.111		
		October	1.078	1.159				1.027	1.123		
	C4	November	1.082	1.166	1.068	1.054		1.028	1.124		
		December	1.082	1.171				1.028	1.124		

Table A-1. Civilian and Military Price Indices (Continued)

			Civilian Indices							Military Indices	
Year	Quarter	Month	CPI-U	CPI-M	HCFA Hospital Input-Price Index	Medicare Economic Index	PPI[a] SIC 8062	PPI SIC 3841	PPI SIC 2834	Military Personnel	O&M[b]
1992		January	1.084	1.182				1.040	1.137		
	C1	February	1.088	1.194	1.075	1.061		1.041	1.150		
		March	1.093	1.201				1.047	1.155		
		April	1.095	1.207				1.048	1.167	1.077	1.074
	C2	May	1.097	1.210	1.082	1.067		1.048	1.170		
		June	1.100	1.215				1.048	1.172		
		July	1.103	1.223				1.046	1.177		
	C3	August	1.106	1.228	1.094	1.074		1.046	1.185		
		September	1.109	1.233				1.050	1.182		
		October	1.113	1.240				1.053	1.190		
	C4	November	1.115	1.246	1.099	1.079		1.050	1.188		
		December	1.114	1.249				1.048	1.195		
1993		January	1.119	1.260			1.260	1.057	1.199		
	C1	February	1.123	1.270	1.108	1.085	1.262	1.059	1.208		
		March	1.127	1.274			1.264	1.065	1.208		
		April	1.130	1.279			1.265	1.068	1.218	1.124	1.100
	C2	May	1.132	1.286	1.116	1.091	1.267	1.070	1.218		
		June	1.133	1.290			1.267	1.069	1.222		
		July	1.133	1.297			1.280	1.058	1.226		
	C3	August	1.137	1.301	1.123	1.097	1.282	1.064	1.230		
		September	1.139	1.304			1.284	1.067	1.228		
		October	1.144	1.311			1.295	1.066	1.233		
	C4	November	1.144	1.314	1.128	1.103	1.295	1.065	1.231		
		December	1.144	1.316			1.296	1.067	1.226		

Table A-1. Civilian and Military Price Indices (Continued)

			Civilian Indices							Military Indices	
Year	Quarter	Month	CPI-U	CPI-M	HCFA Hospital Input-Price Index	Medicare Economic Index	PPI[a] SIC 8062	PPI SIC 3841	PPI SIC 2834	Military Personnel	O&M[b]
1994		January	1.148	1.324			1.305	1.069	1.231		
	C1	February	1.151	1.332	1.136	1.109	1.306	1.074	1.230		
		March	1.155	1.336			1.306	1.075	1.233		
		April	1.157	1.342			1.309	1.074	1.236	1.152	1.122
	C2	May	1.158	1.345	1.141	1.116	1.311	1.074	1.241		
		June	1.162	1.350			1.314	1.072	1.242		
		July	1.165	1.357			1.327	1.074	1.241		
	C3	August	1.170	1.361	1.151	1.122	1.327	1.074	1.242		
		September	1.173	1.365			1.327	1.076	1.243		
		October	1.173	1.373			1.339	1.078	1.244		
	C4	November	1.175	1.377	1.159	1.128	1.340	1.075	1.248		
		December	1.175	1.381			1.340	1.072	1.251		
1995		January	1.180	1.389			1.358	1.079	1.252		
	C1	February	1.184	1.398	1.170	1.134	1.357	1.082	1.253		
		March	1.188	1.401			1.360	1.083	1.256		
		April	1.192	1.404			1.360	1.082	1.265	1.179	1.144
	C2	May	1.195	1.407	1.180	1.140	1.361	1.082	1.266		
		June	1.197	1.410			1.361	1.084	1.267		
		July	1.197	1.416			1.367	1.086	1.267		
	C3	August	1.200	1.421	1.187	1.146	1.371	1.088	1.269		
		September	1.203	1.425			1.371	1.087	1.272		
		October	1.206	1.430			1.388	1.087	1.281		
	C4	November	1.206	1.434	1.192	1.151	1.390	1.082	1.281		
		December	1.205	1.436			1.390	1.088	1.282		

Table A-1. Civilian and Military Price Indices (Continued)

			Civilian Indices							Military Indices	
Year	Quarter	Month	CPI-U	CPI-M	HCFA Hospital Input-Price Index	Medicare Economic Index	PPI[a] SIC 8062	PPI SIC 3841	PPI SIC 2834	Military Personnel	O&M[b]
1996		January	1.212	1.445			1.398	1.101	1.284		
	C1	February	1.216	1.451	1.200	1.157	1.398	1.099	1.284		
		March	1.222	1.453			1.397	1.100	1.283		
		April	1.227	1.456			1.398	1.100	1.282	1.206	1.166
	C2	May	1.229	1.459	1.209	1.163	1.398	1.098	1.284		
		June	1.230	1.461			1.400	1.096	1.287		
		July	1.232	1.467			1.401	1.097	1.290		
	C3	August	1.235	1.470			1.402	1.096	1.290		
		September	1.239	1.471			1.402	1.092	1.289		
		October	1.243	1.476			1.410	1.096	1.291		
	C4	November	1.245	1.479			1.411	1.099	1.291		
		December	1.245	1.479							

a. The PPI for SIC 8062, General Medical and Surgical Hospitals, began in December 1992 with the value 1.000.
To ease comparison with the CPI–M, we have renormalized the January 1993 value of the PPI to equal that of the CPI–M, 1.260.

b. The O&M deflator excludes fuel and civilian pay.

APPENDIX B: TESTIMONY OF KATHERINE G. ABRAHAM, COMMISSIONER OF LABOR STATISTICS, BEFORE THE SENATE FINANCE COMMITTEE, FEBRUARY 11, 1997

APPENDIX B: TESTIMONY OF KATHARINE G. ABRAHAM, COMMISSIONER OF LABOR STATISTICS, BEFORE THE SENATE FINANCE COMMITTEE, FEBRUARY 11, 1997

I appreciate the opportunity to testify today on the final report of the Senate Finance Committee's Advisory Commission to Study the Consumer Price Index. The Commission's review clearly has made a contribution to the ongoing discussion of measurement issues bearing on the accuracy of the Consumer Price Index (CPI), and I appreciate the members' work on this important subject.

I intend this morning to focus my remarks on some of the measurement issues raised in the Commission's report and, perhaps more importantly, to discuss what I believe the Bureau of Labor Statistics (BLS) can and cannot do in the near term to address those issues. I will not focus in my opening remarks on the issues raised by the Commission that relate to possible longer-term improvements in the CPI; although some of these issues are quite important, it is my sense that they are of lesser current interest to the Committee. I will, of course, be happy to respond to any questions about these issues the Members of the Committee may wish to raise.

As I believe the Members of the Committee are aware, the BLS has a long tradition of being in the forefront of price measurement research and operational innovation. Given that tradition, I am especially pleased to be able to report that the President's Fiscal Year (FY) 1998 budget includes a program increment that will allow us to take several steps toward increasing the accuracy of the CPI. The BLS will be requesting resources to speed up the process of updating the CPI market basket in future revisions. Resources to expand the collection of information on the prices and characteristics of certain goods and services, together with resources to be devoted to the early identification of new goods as they become available in the marketplace, also will be requested. This information will enable us to improve the methods we use to adjust for quality change and to insure that new items are brought into the index in a more timely fashion. Finally, the request provides for the production of supplementary measures of change in consumer prices that we believe would provide closer approximations to the change in the cost of living than the currently published CPI. At the appropriate points in

my testimony, I will indicate the relationship between these activities and the issues raised in the Commission's report.

The report begins with one overarching recommendation: "The BLS should establish a cost of living index (COLI) as its objective in measuring consumer prices." This seems basically right to me. Indeed, the BLS long has said that it operates within a cost-of-living framework in producing the CPI. That framework has guided, and will continue to guide, operational decisions about the construction of the index. Putting things slightly differently, if the BLS staff or other technical experts knew how to produce a true cost of living index on a monthly production schedule, that would be what we would produce. I therefore have no fundamental disagreement with the Commission about what the objective of our CPI program ought to be, though we disagree to some extent about what changes to the index would be feasible and prudent and about the timetable on which those changes could be implemented.

More specifically, the Commission's report focuses on two broad issues concerning the CPI as a proxy measuring changes in the cost of living of the U.S. consumer. The first is substitution bias, comprising what the Commission terms lower-level and upper-level components. The Commission believes that these components together impart an upward bias in the CPI of 0.4 percentage point per year. The second broad issue involves how best to treat changes in the quality of goods and services that consumers buy, changes in how and where those goods and services are sold, and the emergence of new goods and services. The Commission believes that failure to adjust adequately for these effects imparts a 0.7 percentage point per year upward bias to the CPI. The total overstatement of the change in the cost of living due to substitution bias and other problems together is judged by the Commission to amount to 1.1 percentage points per year.

Let me talk first about substitution bias. Like the Commission members, I also am an economist. Almost any economist would agree that an index such as the CPI that tracks the cost of purchasing a fixed market basket of goods and services represents an upper bound on the change in the cost of living. Indeed, for many years, the BLS has attempted to explain exactly this point.

Operationally, as the Commission suggests, substitution bias may show up at two levels. By way of background, the CPI is constructed by first aggregating the roughly 90,000 price quotations collected each month to form a series of subindexes for categories of items such as "Apples," "Men's Shirts," and "Prescription Drugs," and then

aggregating those subindexes to form the overall CPI. The formula used to aggregate the individual price quotations to form the subindexes does not account for consumers' ability to substitute across items within item categories when the relative prices of those items change — for example, when the price of Delicious apples increases and the price of Granny Smith apples falls. Similarly, the formula used to aggregate the subindexes to form the overall CPI does not reflect the substitution across item categories that takes place when the relative prices of items in different categories change — for example, when the price of apples falls relative to the price of oranges. Were such substitution taken into account, the CPI undoubtedly would rise less rapidly.

To address the so-called lower-level substitution problem, the Commission has suggested adoption of an alternative formula for aggregating price quotations, one that has been under investigation by the BLS over the past several years. As noted above, the current CPI formula does not allow for the potential substitution among items within a category, such as between different varieties of apples, when the relative prices of those items change. The proposed alternative formula, termed the geometric mean formula, is based on a different assumption about consumers' substitution behavior, namely that consumers substitute among items in such a way as to hold the share of their expenditures devoted to each item constant. Neither the assumption of no substitution underlying our current practice nor the assumption underlying the geometric mean formula is likely to provide a close approximation in all cases. It may be more plausible to assume that consumers substitute freely between types of apples or between brands of television sets when their relative prices change than to assume similar substitutability between types of prescription drugs or between electric power companies. The BLS has made a commitment to evaluate the likely applicability of the two alternative assumptions, item category by item category, over the next year or so, and to make a decision at that point about whether to adopt the geometric mean formula in some components of the index.

Upper-level substitution bias occurs because the formula currently used to aggregate CPI subindexes ignores the fact that consumers substitute across item categories when relative prices change. Here, however, the nature of the operational problem faced by the BLS is a bit different than that at the lower level of item aggregation. The detailed data needed to account for lower-level substitution in the calculation of CPI subindexes are simply not available. In contrast, at the upper level of item aggregation, the BLS does collect information on consumer expenditures across item categories, like apples, men's shirts, and prescription drugs. Therefore, it is possible to construct a measure that accounts for substitution across those item categories in response

to relative price changes, though not on the same schedule as the current CPI. The expenditure information required to construct such a measure — one of the so-called superlative indexes — is available only with a lag, so that the index cannot be produced until the fall following the year to which it applies. The BLS currently produces these measures on an experimental basis, and would be happy to produce them to a higher standard of precision and reliability. Thus, we are receptive to the spirit of the Commission's recommendation that we produce an annual superlative index as a supplement to the official monthly CPI, and will be able to make substantial headway in this regard if we receive the FY 1998 program increase we will be requesting.

Recognizing the unavoidable time lag in producing a true superlative measure, the Commission recommends that the BLS explore steps that might make the monthly CPI a better approximation to such an index. The Commission has suggested, for example, that updating the index's expenditure weights on a continuous rather than a periodic basis and changing the formula for aggregating subindexes might make the CPI behave more like a superlative index. The BLS is, of course, open to exploring this sort of option, as can be seen in the variety of experimental indexes we have published for some time, and we will continue our work in this area. Adopting any option that has neither a sound theoretical foundation nor a clear empirical justification, however, would be a mistake. We can produce superlative measures, albeit with a lag, and thus convincingly deal with the "substitution bias" problem. I believe we would gain little, and possibly do much damage to the credibility of our statistical system, if we were to move hastily to adopt untested techniques for producing the official CPI.

I have, purposely, spent a good deal of time talking about substitution bias. The largest share of the bias in the CPI that the Commission concludes exists — 0.7 percentage point per year, or nearly two-thirds of the total of 1.1 percentage points per year — arises from other sources. The Commission believes that the failure to make adequate adjustment for changes in the quality of the goods and services people buy and to account properly for the value to consumers of newly available goods, together with deficiencies in the way the CPI treats differences in the prices charged at different retail outlets, constitute a serious problem.

Before commenting on the evidence marshaled by the Commission in support of its conclusions in the quality/new goods area, I would like to note that the BLS already has procedures in place designed to account for changes in the quality of the items being priced. (It often mistakenly has been assumed, though not by the Commission, that BLS makes few or no such adjustments.) Although I would readily acknowledge that our

adjustment procedures are not perfect, they do have a very important effect on the rate of price change the BLS reports. The best available information on this point applies to a CPI subindex covering roughly the commodities and services component of the market basket (about 70 percent of the total, with shelter the largest exclusion). During 1995, this subindex would have risen by 4.7 percentage points had these procedures not been applied. Because of their application, however, the subindex actually rose by only 2.2 percentage points over the year. Roughly speaking, these figures imply that the adjustments made by the BLS for changes in the quality of these goods and services amounted to 2.5 percentage points over the course of a single year. I would add that the BLS also has established procedures for bringing new items and new outlets into the index. The expenditure share information used to aggregate the CPI subindexes is updated only once every ten years or so, but the specific stores in which prices are collected and the specific items priced are reselected on a five-year cycle. Although more frequent sample rotations undoubtedly would be desirable, it is a fact that a considerable share of the resources available for producing the CPI are devoted to ensuring that the sample of items priced is representative of what consumers actually are purchasing.

The Commission does not argue, of course, that the BLS is not making a good effort to address quality/new goods biases, but rather that, in spite of a good effort, residual bias remains. The report's approach to assessing this residual bias is to divide the index into 27 categories, and then to make a judgment about the magnitude of the bias in each case. Unfortunately, the evidence applicable to many of these categories is rather sparse.

In some of the categories, absent evidence, the Commission is forced to fall back on its best judgment. The food and beverages categories are perhaps the best examples; the Commission's estimates of upward biases in these categories rest exclusively on not implausible, but unsubstantiated, judgments regarding the value to consumers of increased variety on grocery and liquor store shelves, together with the value of greater choice in restaurants.

In other cases, members of the Commission have produced evidence that bears on the trend in prices for particular sorts of items. I cannot say, however, that this evidence always leads me to the same conclusions as those reached by the Commission. The Commission's estimate that the growth in prices of new and used cars has been overstated by 0.6 percentage point per year in the recent past, for example, rests on data showing that the average age of cars on the road has risen, together with an assumption that current CPI procedures do not capture any of the increases in automobile durability that may have

occurred. This latter assumption, however, is incorrect; attached to my testimony is a document listing some of the many durability-related model changes for which adjustments have been made in the CPI over the past few years.

The Commission's estimate that the CPI has overstated the rate of growth of apparel prices by 1.0 percentage point per year since 1985, to take another example, rests on a comparison of the official CPI data with price indexes constructed using Sears catalogue prices for items remaining unchanged from one year to the next. Even beyond the reservations I have about drawing any general conclusions based upon the prices charged by a single catalogue merchant, I am skeptical of any index based only on the prices of unchanging items, particularly in a market segment where changing fashion is as important as it is in apparel.

On another note, I also would have found the report more persuasive had the Commission made a more systematic effort to explore the possible existence of negative biases in the CPI. Other analysts have hypothesized reduced convenience and comfort of air travel, and deteriorating quality of higher education, as examples of quality decreases that are ignored in the CPI. More generally, whereas the Commission notes some service quality improvements, such as the introduction of automatic credit-card readers at gasoline pumps, the BLS often hears complaints about broad-ranging declines in the quality of customer service, which are equally difficult to incorporate in the CPI.

A more subtle issue is that price increases for many goods occur intermittently and often are timed to coincide with model replacements or other quality improvements. The BLS commonly adjusts for quality differences between successive models by, in effect, treating the difference in price between them as wholly attributable to a difference in quality. There is a risk that this procedure over-adjusts for quality change, imparting a downward bias to the index. Methods have been introduced to try to minimize that possibility, but the Commission paid little attention to this potential problem.

Close to half of the quality/new goods bias the Commission believes exists in the overall CPI is judged to occur in just two areas of the index: medical care and high-tech consumer goods. These clearly are components of the index in which the BLS faces particularly difficult measurement problems, though I cannot say what the magnitude of any bias in these index components might be.

From a BLS perspective, the most important question about possible quality/new goods problems is what we might do to improve our procedures and ameliorate those problems. Recognizing the particular difficulties associated with measuring medical care

prices and high-tech consumer goods prices, the BLS has devised and announced important improvements in our methods. These include changes in our hospital price measurement procedures, effective with the data for January of this year, and changes in our sample rotation procedures that will allow us to update item samples in rapidly changing market segments more frequently than once every five years (at the cost of less frequent updates in more static market segments). In addition, the FY 1998 budget we will be submitting would allow us to make important progress in the quality/new goods area, by supporting greater use of techniques that explicitly account for changes in the characteristics of items being purchased and implementation of more aggressive procedures for identifying and beginning to price new goods promptly once they appear in the marketplace.

The Commission's report also discusses the question of new outlet bias, namely, how changes in the mix of retail outlets at which consumers shop ought to be treated. Current CPI procedures treat purchases of a particular item at different retail outlets as distinct transactions; the prices at the different stores are never directly compared. This could impart an upward bias to the CPI if, for example, stores offering lower prices but comparable service gained in market share. As a practical matter, however, measurement of any such bias is complicated by the fact that different types of outlets commonly offer quite different shopping environments. Research on the factors affecting consumers' choices about where to shop ultimately may be helpful in devising appropriate procedures for dealing with changes in outlet mix.

All of this, however, leaves us a long way from having a complete solution to the quality/new goods and new outlet problems the Commission believes exist with the CPI. There is much of what the Commission discusses that we do not know how to measure — or, to put it another way, for which economists simply do not have operational procedures to correct the problems cited. Let me try to illustrate what I mean. Has the variety of goods and services available to consumers grown? I am certain that it has. Is this variety of value to consumers? Again, I would answer yes. We are, however, a very long way from being able to measure the value of that variety, and thus a very long way from being able to reflect the value of increased variety in the monthly CPI. We have been actively working on potential uses for scanner data in the CPI, one of which might be to allow us to identify new product introductions soon after they occur. Unfortunately, the techniques available for measuring the gains in consumer welfare from those new products (and the losses from product disappearances) are in their infancy, and may never

be adaptable for implementation in a large, ongoing price measurement program like the CPI.

To take another example, I would readily acknowledge that there have been major improvements in the medical treatment available for many serious health problems — improvements that have been of indubitable value to those suffering from the afflictions in question. Unfortunately, as a general matter, the BLS has no good way to measure the value of these improvements. Consider, to take just one example, a hypothetical improvement in knee surgery techniques that gives patients greater mobility following surgery than they previously could have expected. This improved mobility undoubtedly would be of value to those who benefit from the improvement in technique, but there is no obvious or clearly objective way to quantify that value. This is, I believe, an important point about which the Commission and the BLS are in agreement.

The BLS is committed to producing the very best CPI it can. Indeed, as I've noted, our Fiscal Year 1998 budget request proposes an increase in funding that would enable us to make significant progress on a number of the issues we have discussed here today. Although I believe that we can make important improvements in the CPI, I do not believe it to be possible to produce a perfect cost-of-living measure. This means that those who use the data we are able to produce should recognize the limitations of those data and exercise judgment accordingly concerning whether and how the data ought to be used.

ATTACHMENT: EXAMPLES OF NEW CAR RELIABILITY/DURABILITY QUALITY ADJUSTMENTS IN THE CPI SINCE 1992:

- Improved corrosion protection — body, electrical system, fuel tank, pump, shocks, brakes and cables
- Increased warranties
- Body side cladding
- Sealing improvements
- Stainless steel exhaust
- Longer life spark plugs — 100,000 mile life
- Improved steering gears
- Powertrain improvements
- Dextron III transmission fluid — 100,000 mile life
- Water pump front face — 150,000 mile life
- Battery saver
- Increased catalyst load — 100,000 mile life
- Rust resistant fuel injection — 100,000 mile life
- Clearcoat paint
- Sided galvanized steel body panels
- Serpentine drive belt.

APPENDIX C: COMPOSITION OF PPI FOR SIC 3841

APPENDIX C: COMPOSITION OF PPI FOR SIC 3841

This appendix gives the composition of the Producer Price Index for SIC 3841, Surgical and Medical Instruments and Apparatus. This index reflects sales by "establishments primarily engaged in manufacturing medical, surgical, ophthalmic, and veterinary instruments and apparatus." The exact composition is found in U.S. Office of Management and Budget, *Standard Industrial Classification Manual—1987*, Washington, D.C., 1987, p. 250, and is reproduced here.

- Anesthesia apparatus
- Biopsy instruments and equipment
- Blood pressure apparatus
- Blood transfusion equipment
- Bone drills
- Bone plates and screws
- Bone rongeurs
- Bronchoscopes, except electromedical
- Cannulae
- Catheters
- Clamps, surgical
- Corneal microscopes
- Cystoscopes, except electromedical
- Diagnostic apparatus, physicians'
- Eye examining instruments and apparatus
- Fixation appliances, internal
- Forceps, surgical
- Gastroscopes, except electromedical
- Hemodialysis apparatus
- Holders, surgical needle
- Hypodermic needles and syringes

- Intravenous transfusion apparatus
- Inhalation therapy equipment
- Inhalators, surgical and medical
- Instruments and apparatus, except electromedical: medical, surgical, ophthalmic, and veterinary
- Instruments, microsurgical: except electromedical
- Knives, surgical
- Metabolism apparatus
- Muscle exercise apparatus, ophthalmic
- Needle holders, surgical
- Needles, suture
- Operating tables
- Ophthalmic instruments and apparatus
- Ophthalmometers and ophthalmoscopes
- Optometers
- Otoscopes, except electromedical
- Oxygen tents
- Pelvimeters
- Physiotherapy equipment, electrical
- Probes, surgical
- Retinoscopes, except electromedical
- Retractors
- Rifles for propelling hypodermics into animals
- Saws, surgical
- Skin grafting equipment
- Slit lamps (ophthalmic goods)
- Speculums
- Sphygmomanometers
- Stethoscopes and stethographs
- Suction therapy apparatus
- Surgical instruments and apparatus, except electromedical

- Surgical knife blades and handles
- Tonometers, medical
- Trocars
- Ultrasonic medical cleaning equipment
- Veterinarians' instruments and apparatus.

APPENDIX D: DHP INFLATION RATES BY OBJECT CLASS

APPENDIX D: DHP INFLATION RATES BY OBJECT CLASS

This appendix gives the inflation rates used in constructing the FY 1995 and FY 1996 DHP budget requirements. The source of the FY 1994/1995 data is U.S. Department of Defense, "Defense Health Program, Fiscal Years 1996/1997: Justification of O&M Estimates," Office of the Assistant Secretary of Defense (Health Affairs). The source of the FY 1995/1996 data is U.S. Department of Defense, "Defense Health Program, Fiscal Year 1997: Justification of O&M Estimates," Office of the Assistant Secretary of Defense (Health Affairs).

Table D-1. FY 1994/1995 Inflation Rates by Object Class

Line	Description	FY1994 Program	Price Growth Percent
301	Per Diem	76,789	0.00
302	Other Travel Costs	62,195	2.80
303	MAC Passenger	5,441	2.28
307	Leased Vehicles	2,443	2.78
399	Total Travel	146,868	
401	DFSC Fuel	28,294	-12.40
402	Service Fund Fuel	157	-12.10
411	Army Sup & Mat	29,600	8.00
412	Navy Sup & Mat	104,885	22.67
414	AF Sup & Mat	1,490	-9.93
415	DLA Sup & Mat	57,565	3.20
416	GSA Sup & Mat	9,291	2.81
417	Local Proc Sup & Mat	526,967	2.80
499	Total Sup & Mat	758,249	
502	Army Fund Equipt	1,130	5.29
503	Navy Fund Equipt	2,263	-22.50
505	AF Fund Equipt	23,393	-16.50
506	DLA Fund Equipt	2,106	0.61
507	GSA Fund Equipt	4,485	2.00
599	Total Fund Equipt	33,377	
602	Army Depot Cmd Maint	165	15.76
611	Naval Surface War Ctr	0	3.10
615	Data Automat Ctr Navy	220	1.36
620	Fleet Aux Ships Navy	0	2.80
624	Other MSC Purchases	0	2.80
630	Naval Rsch Lab	0	2.80
631	Naval Civil Engnr Ctr	447	5.82
633	Naval Pub & Prnt Svc	8,251	16.00
635	Nav Pub Wrk Ctr: Pub Wrks	74,207	0.20
637	Naval Shipyards	1,967	18.71
651	Airlift Svcs Trng & Ops	19,824	2.80
652	Airlift Svcs Med Evac	0	2.80
663	Laundry & Dry Clean	1,576	0.00
671	Communications Svc	5,159	2.79
673	Def Finance & Acct Svc	5,164	20.80
679	Cost Reimbursible Svc	825	2.79
699	Total Purchases	117,805	

Table D-1. FY 1994/1995 Inflation Rates by Object Class (continued)

Line	Description	FY1994 Program	Price Growth Percent
701	MAC Cargo	0	2.80
702	MAC SAAM	0	15.00
703	JCS Exercises	0	2.80
711	MSC Cargo	0	-24.20
721	MTMC Port Handling	0	9.50
725	MTMC Other	6	0.00
731	Commercial Air	918	2.72
741	Commerical Ships	82	2.44
751	Commercial Land	924	2.80
761	Other Transportation	3,175	2.84
799	Total Transportation	5,105	
9XX	Civ Pay Reimburs Host	1,744,305	2.40
901	Foreign Nat Ind Hire	39,408	2.40
902	Separation Liability	1,888	2.37
912	Rental Pay to GSA	8,683	2.81
913	Purchased Utilities	80,452	2.80
914	Purchased Communica	35,135	2.80
915	Rents non GSA	24,033	2.80
916	Disability Comp	4,708	2.80
917	Postal Svcs	2,126	6.21
920	Supplies & Mat	637,711	4.73
921	Printing & Reproduct	10,353	2.80
922	Equipt Maint Contract	80,388	2.80
923	Facility Maint Contract	90,677	2.80
925	Equipt Purchases	97,304	4.50
926	Overseas Purchases	1,429	2.80
930	Other Depot Maint	34,141	2.80
931	Contract Consultants	0	2.80
932	Mgmt & Prof Spt Svc	4,442	2.79
933	Studies Analysis Eval	15,053	2.80
934	Engineering Tech Svc	0	2.80
937	Fuel	704	2.84
985	DoD Counter Drug	7	0.00
987	Other Intra-Govt	8,744	2.80
988	Grants	12,294	2.81
989	Other Contracts	4,950,528	4.86
998	Other Costs*	398,293	3.81
999	Total Purchases	8,282,806	4.16
9999	TOTAL:	9,344,210	4.16

Table D-2. FY 1995/1996 Inflation Rates by Object Class

Line	Description	FY1995 Program	Price Growth Percent
308	Travel of Persons	153,966	0.91
401	DFSC Fuel	20,286	5.60
402	Service Fund Fuel	869	5.64
411	Army Sup & Mat	28,288	5.30
412	Navy Sup & Mat	16,343	-22.50
414	AF Sup & Mat	745	-16.38
415	DLA Sup & Mat	75,246	0.60
416	GSA Sup & Mat	17,696	2.00
417	Local Proc Sup & Mat	910,764	2.00
499	Total Sup & Mat	1,070,237	
502	Army Fund Equipt	3,891	5.29
503	Navy Fund Equipt	1,911	-22.50
505	AF Fund Equipt	62,695	-16.50
506	DLA Fund Equipt	2,632	0.61
507	GSA Fund Equipt	7,692	2.00
599	Total Fund Equipt	78,821	
602	Army Depot Cmd Maint	233	-23.18
611	Naval Surface War Ctr	0	0.00
615	Data Automat Ctr Navy	248	0.00
620	Fleet Aux Ships Navy	0	0.00
624	Other MSC Purchases	0	0.00
630	Naval Rsch Lab	0	0.00
631	Naval Civil Engnr Ctr	96	3.13
633	Naval Pub & Prnt Svc	12,888	-6.80
634	Nav Pub Wrk Ctr: Utilities	48,824	-7.20
635	Nav Pub Wrk Ctr: Pub Wrks	79,181	1.00
637	Naval Shipyards	845	0.00
651	Airlift Svcs Trng & Ops	16,606	2.00
652	Airlift Svcs Med Evac	0	0.00
663	Laundry & Dry Clean	1,235	0.00
671	Communications Svc	6,880	-5.70
673	Def Finance & Acct Svc	32,510	-19.80
679	Cost Reimbursible Svc	25	4.00
699	Total Purchases	199,571	
701	MAC Cargo	0	0.00
702	MAC SAAM	81	14.81
703	JCS Exercises	0	0.00
711	MSC Cargo	3	33.33
721	MTMC Port Handling	0	0.00
725	MTMC Other	0	0.00
771	Commercial Transportation	4,620	1.99
761	Other Transportation	1,561	1.97
799	Total Transportation	6,265	

Table D-2. FY 1995/1996 Inflation Rates by Object Class (continued)

Line	Description	FY1995 Program	Price Growth Percent
9XX	Civ Pay Reimburs Host	1,764,917	2.00
901	Foreign Nat Ind Hire	42,108	2.00
902	Separation Liability	4,842	1.98
912	Rental Pay to GSA	7,712	2.00
913	Purchased Utilities	57,211	2.00
914	Purchased Communica	34,680	2.00
915	Rents non GSA	20,559	2.00
916	Disability Comp	5,183	1.99
917	Postal Svcs	3,457	2.52
920	Supplies & Mat	348,302	4.01
921	Printing & Reproduct	6,221	1.99
922	Equipt Maint Contract	86,713	2.00
923	Facility Maint Contract	172,703	2.00
925	Equipt Purchases	212,336	3.99
926	Overseas Purchases	3,462	1.99
930	Other Depot Maint	30,933	2.00
931	Contract Consultants	0	0.00
932	Mgmt & Prof Spt Svc	1,078	2.04
933	Studies Analysis Eval	12,893	2.00
934	Engineering Tech Svc	0	0.00
937	Fuel	845	2.01
985	DoD Counter Drug	880	2.05
987	Other Intra-Govt	11,435	2.00
988	Grants	12,334	2.00
989	Other Contracts	4,902,822	4.36
998	Other Costs*	372,676	4.00
999	Total Purchases	8,116,302	3.66
9999	TOTAL:	9,625,162	3.07

APPENDIX E: O&M PRICE GROWTH BETWEEN FY 1994 AND FY 1995

APPENDIX E: O&M PRICE GROWTH BETWEEN FY 1994 AND FY 1995

This Appendix calculates the effects of substituting the PPI (surgical and medical instruments and apparatus) and the HCFA hospital input-price index for the indices actually used to construct the FY 1995 DHP. The analysis parallels that reported in Chapter IV of the main text for FY 1996.

Table E-1. O&M Price Growth Between FY 1994 and FY 1995, DHP Versus IDA Inflators (Thousands of Dollars)

Funding Category	Sub-Activity Group	Object Class Number	Object Class Description	FY 1994 Funding	Inflator DHP	Inflator IDA	Price Growth DHP	Price Growth IDA	Difference
1. Supplies and materials	Direct patient care	920	Supplies and materials	558,330	5.00%[a]	0.74%[b]	27,917	4,159	–$23,758
2. Equipment purchases	Direct patient care	925	Equipment purchases	75,075	5.00%[a]	0.74%[b]	3,754	559	–$3,195
3. Direct patient care, other contracts	Direct patient care	989	Other contracts	674,473	5.00%[a]	5.00%[a]	33,724	33,724	0
4. Supplemental care	Care in non-defense facilities	989	Other contracts	178,311	5.00%[a]	5.00%[a]	8,916	8,916	0
5. USTFs	Care in non-defense facilities	998	Other costs	265,000	5.00%[a]	5.00%[a]	13,250	13,250	0
6. Patient care support, other contracts	Patient care support	989	Other contracts	177,505	5.00%[a]	5.00%[a]	8,875	8,875	0
7. MCS contracts	Managed-care support	989	Other contracts	793,600	5.00%[a]	5.00%[a]	39,680	39,680	0
8. CHAMPUS	CHAMPUS	989	Other contracts	2,524,500	5.00%[a]	5.00%[a]	126,225	126,225	0
9. Stock-funded	Defense Health Program	301–799		1,061,404	4.10%	4.10%	43,564	43,564	0
10. DoD civilian pay	Defense Health Program	9XX	Reimbursable civilian pay	1,744,305	2.40%	3.42%[c]	41,863	59,621	$17,758
11. Non-labor, non-stock-funded	Residual			1,291,707	3.20%	3.42%[c]	41,389	44,151	$2,762
Total/Weighted Average				9,344,210	4.16%	4.10%	389,156	382,724	–$6,432

Source: "Defense Health Program, Fiscal Years 1996/1997: Justification of O&M Estimates," Department of Defense, Office of the Assistant Secretary of Defense (Health Affairs), Exhibit OP–32.

Notes:
a. Projected percentage increase in CPI–M, FY 1994 to FY 1995.
b. Actual percentage increase, PPI (surgical and medical instruments and apparatus), May 1994 to May 1995.
c. Actual percentage increase, HCFA hospital input-price index, May 1994 to May 1995.

APPENDIX F: EQUIVALENCE BETWEEN LOGARITHMIC CHANGES AND PERCENTAGE CHANGES

APPENDIX F: EQUIVALENCE BETWEEN LOGARITHMIC CHANGES AND PERCENTAGE CHANGES

This appendix establishes the equivalence between logarithmic changes and properly measured percentage changes. Consider a variable Y that is observed in two consecutive time periods, with respective values Y_0 and Y_1. The logarithmic change is defined as:

$$\ln\left[\frac{Y_1}{Y_0}\right] = \ln\left[1 + \frac{Y_1}{Y_0} - \frac{Y_0}{Y_0}\right] = \ln\left[1 + \left(\frac{Y_1 - Y_0}{Y_0}\right)\right], \tag{F-1}$$

where "ln" denotes the natural logarithm. It follows from a second-order Taylor series that, for any $X > -1$:

$$\ln(1+X) \approx X - \left(X^2/2\right). \tag{F-2}$$

Combining equations (F-1) and (F-2), we obtain the following bound:

$$\ln\left[\frac{Y_1}{Y_0}\right] \approx \left(\frac{Y_1 - Y_0}{Y_0}\right) - (1/2)\left(\frac{Y_1 - Y_0}{Y_0}\right)^2 < \left(\frac{Y_1 - Y_0}{Y_0}\right). \tag{F-3}$$

We see that the percentage change *relative to a base of* Y_0 is underestimated by the logarithmic change; substitution of one for the other yields only first-order accuracy.

We may obtain second-order correspondence between the logarithmic and percentage changes if we measure the latter *relative to the simple average* of Y_0 and Y_1. To develop this approach, consider the central-difference approximation to a derivative:

$$f'(X) \approx \frac{f(X+h) - f(X-h)}{2h} \tag{F-4}$$

where f is a differentiable function. This approximation is accurate to the second-order.[1] Let $Y_1 = X + h$ and $Y_0 = X - h$, so that their simple average is X:

$$\overline{Y} = (Y_0 + Y_1)/2 = X \,. \tag{F-5}$$

Combining equations (F-4) and (F-5), we obtain the second-order approximation:

$$f(Y_1) = f(X+h) \approx f(X-h) + 2h\,f'(X) = f(Y_0) + (Y_1 - Y_0)\,f'(\overline{Y}) \,. \tag{F-6}$$

This formula differs from the standard, first-order Taylor series in that the derivative is evaluated at $\overline{Y}$ rather than at Y_0. This seemingly minor modification serves to increase the order of approximation.

Now set $Y_1 = Z$, $Y_0 = 0$, and apply equation (F-6) to the function $f(Z) = \ln(1+Z)$, where $f'(Z) = 1/(1+Z)$:

$$\ln(1+Z) = f(Z) \approx f(0) + Z\,f'(Z/2) = Z\left[1\big/\left(1+(Z/2)\right)\right] = \frac{2Z}{2+Z} \,. \tag{F-7}$$

To complete the derivation, set $Z = (Y_1 - Y_0)/Y_0$ and combine equations (F-1) and (F-7) to obtain the second-order approximation:

$$\ln\left[\frac{Y_1}{Y_0}\right] = \ln\left[1 + \left(\frac{Y_1 - Y_0}{Y_0}\right)\right] \approx \frac{2 \times \left[(Y_1 - Y_0)/Y_0\right]}{2 + \left[(Y_1 - Y_0)/Y_0\right]} = \left(\frac{Y_1 - Y_0}{\overline{Y}}\right). \tag{F-8}$$

We see that, while the logarithmic change is only a first-order approximation to the percentage change relative to Y_0 (equation F-3), it is a second-order approximation to the percentage change relative to the simple average $\overline{Y}$ (equation F-8). In fact, we have the following inequalities:

$$\begin{aligned}
&\text{if } 0 < Y_0 < \overline{Y} < Y_1, \text{ then } 0 < \ln\left[\frac{Y_1}{Y_0}\right] \approx \left(\frac{Y_1 - Y_0}{\overline{Y}}\right) < \left(\frac{Y_1 - Y_0}{Y_0}\right); \\
&\text{if } 0 < Y_1 < \overline{Y} < Y_0, \text{ then } \ln\left[\frac{Y_1}{Y_0}\right] \approx \left(\frac{Y_1 - Y_0}{\overline{Y}}\right) < \left(\frac{Y_1 - Y_0}{Y_0}\right) < 0.
\end{aligned} \tag{F-9}$$

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1 Philip Gill, Walter Murray, and Margaret Wright, *Practical Optimization*, London: Academic Press, 1981, p. 54, equation 2.63.

Finally, equation (F-8) may also be given an interpretation in terms of logarithmic derivatives. Consider the following derivative:

$$
\begin{aligned}
\frac{d\ln Y}{dt} &= \lim_{\Delta t \to 0^+}\left[\frac{\ln Y(t+\Delta t) - \ln Y(t)}{\Delta t}\right] \\
&= \lim_{\Delta t \to 0^+}\left[\frac{\ln\left(Y(t+\Delta t)/Y(t)\right)}{\Delta t}\right].
\end{aligned}
\tag{F-10}
$$

A discrete-time approximation to equation (F-10) is obtained by evaluating the ratio at $\Delta t = 1.0$, yielding:

$$
\frac{d\ln Y}{dt} \approx \ln\left(\frac{Y(t+1)}{Y(t)}\right) = \ln\left[\frac{Y_1}{Y_0}\right] \approx \left(\frac{Y_1 - Y_0}{\bar{Y}}\right). \tag{F-11}
$$

Thus, the following three quantities are close approximations to each other: the logarithmic derivative, the logarithmic ratio, and the percentage change relative to the simple average.

APPENDIX G: MILITARY TREATMENT FACILITIES INCLUDED IN THE INTENSITY ANALYSIS SAMPLE

APPENDIX G: MILITARY TREATMENT FACILITIES INCLUDED IN THE INTENSITY ANALYSIS SAMPLE

This appendix lists the names, locations, and Service affiliations of the 75 MTFs used in the intensity analysis.

Table G-1. Military Treatment Facilities Included in Intensity Analysis Sample

DMIS ID	DMIS Facility Name	Facility Name	Installation Name	State	Service	Size Class
1	Fox ACH–Redstone Arsenal	Fox ACH	Redstone Arsenal	AL	Army	Small Hospital
2	Noble ACH–Ft. McClellen	Noble ACH	Ft. McClellan	AL	Army	Small Hospital
3	Lyster ACH–Ft. Rucker	Lyster ACH	Ft. Rucker	AL	Army	Small Hospital
4	502nd Med Grp–Maxwell	502nd Medical Group	Maxwell AFB	AL	Air Force	Small Hospital
8	Bliss ACH–Ft. Huachuca	Bliss ACH	Ft. Huachuca	AZ	Army	Small Hospital
10	355th Med Grp–Davis Monthan	355th Medical Group	Davis Monthan AFB	AZ	Air Force	Small Hospital
32	Evans ACH–Ft. Carson	Evans ACH	Ft. Carson	CO	Army	Large Hospital
33	USAF Academy Hosp	USAF Academy Hospital	USAF Academy	CO	Air Force	Small Hospital
35	NH Groton	NH Groton	Groton	CT	Navy	Small Hospital
36	436th Med Grp–Dover	436th Medical Group	Dover AFB	DE	Air Force	Small Hospital
37	Walter Reed AMC–Washington DC	Walter Reed AMC	Washington DC	DC	Army	Medical Center
38	NH Pensacola	NH Pensacola	Pensacola	FL	Navy	Large Hospital
39	NH Jacksonville	NH Jacksonville	Jacksonville	FL	Navy	Large Hospital
42	646th Med Grp–Eglin	646th Medical Group	Eglin AFB	FL	Air Force	Large Hospital
43	325th Med Grp–Tyndall	325th Medical Group	Tyndall AFB	FL	Air Force	Small Hospital
45	56th Med Grp–Macdill	56th Medical Group	Macdill AFB	FL	Air Force	Small Hospital
46	45th Med Grp–Patrick	45th Medical Group	Patrick AFB	FL	Air Force	Small Hospital
47	Eisenhower AMC–Ft. Gordon	Eisenhower AMC	Ft. Gordon	GA	Army	Medical Center
48	Martin ACH–Ft. Benning	Martin ACH	Ft. Benning	GA	Army	Large Hospital
49	Winn ACH–Ft. Stewart	Winn ACH	Ft. Stewart	GA	Army	Small Hospital
50	347th Med Grp–Moody	347th Medical Group	Moody AFB	GA	Air Force	Small Hospital
51	653rd Med Grp–Robins	653rd Medical Group	Robins AFB	GA	Air Force	Small Hospital
53	366th Med Grp–Mountain Home	366th Medical Group	Mountain Home AFB	ID	Air Force	Small Hospital
55	USAF Med Ctr Scott	USAF Med Ctr Scott	Scott AFB	IL	Air Force	Medical Center
56	NH Great Lakes	NH Great Lakes	Great Lakes	IL	Navy	Large Hospital
57	Irwin ACH–Ft. Riley	Irwin ACH	Ft. Riley	KS	Army	Large Hospital
58	Munson ACH–Ft. Leavenworth	Munson ACH	Ft. Leavenworth	KS	Army	Small Hospital

Table G-1. Military Treatment Facilities Included in Intensity Analysis Sample (Continued)

DMIS ID	DMIS Facility Name	Facility Name	Installation Name	State	Service	Size Class
60	Blanchfield ACH–Ft. Campbell	Blanchfield ACH	Ft. Campbell	KY	Army	Large Hospital
61	Ireland ACH–Ft. Knox	Ireland ACH	Ft. Knox	KY	Army	Large Hospital
62	2nd Med Grp–Barksdale	2nd Medical Group	Barksdale AFB	LA	Air Force	Small Hospital
64	Bayne–Jones ACH–Ft. Polk	Bayne–Jones ACH	Ft. Polk	LA	Army	Small Hospital
66	Malcolm Grow Med Ctr–Andrews	Malcolm Grow USAF Medical Center	Andrews AFB	MD	Air Force	Medical Center
67	NNMC Bethesda	NNMC Bethesda	Bethesda	MD	Navy	Medical Center
68	NH Patuxent River	NH Patuxent River	Patuxent River	MD	Navy	Small Hospital
69	Kimbrough ACH–Ft. Meade	Kimbrough ACH	Ft. Meade	MD	Army	Small Hospital
73	Keesler Medical Center	Keesler Medical Center	Keesler AFB	MS	Air Force	Medical Center
74	14th Med Squad–Columbus	14th Medical Squadron	Columbus AFB	MS	Air Force	Small Hospital
75	L. Wood ACH–Ft. Leonard Wood	L. Wood ACH	Ft. Leonard Wood	MO	Army	Large Hospital
76	351st Med Grp–Whiteman	351st Medical Group	Whiteman AFB	MO	Air Force	Small Hospital
78	Ehrling Berquist Hosp–Offutt	Ehrling Berquist Hospital	Offutt AFB	NE	Air Force	Small Hospital
79	554th Med Grp–Nellis	554th Medical Group	Nellis AFB	NV	Air Force	Small Hospital
81	Patterson ACH–Ft. Monmouth	Patterson ACH	Ft. Monmouth	NJ	Army	Small Hospital
83	542nd Med Grp–Kirtland	542nd Medical Group	Kirtland AFB	NM	Air Force	Small Hospital
84	49th Med Grp–Holloman	49th Medical Group	Holloman AFB	NM	Air Force	Small Hospital
86	Keller ACH–West Point	Keller ACH	West Point	NY	Army	Small Hospital
89	Womack ACH–Ft. Bragg	Womack ACH	Ft. Bragg	NC	Army	Large Hospital
91	NH Camp Lejeune	NH Camp Lejeune	Camp Lejeune	NC	Navy	Large Hospital
92	NH Cherry Point	NH Cherry Point	Cherry Point	NC	Navy	Small Hospital
93	319th Med Grp–Grand Forks	319th Medical Group	Grand Forks AFB	ND	Air Force	Small Hospital
94	5th Med Grp–Minot	5th Medical Group	Minot AFB	ND	Air Force	Small Hospital
95	USAF Med Ctr Wright–Patterson	USAF Med Ctr Wright–Patterson	Wright–Patterson AFB	OH	Air Force	Medical Center
96	654th Med Grp–Tinker	654th Medical Group	Tinker AFB	OK	Air Force	Small Hospital
97	97th Med Grp–Altus	97th Medical Group	Altus AFB	OK	Air Force	Small Hospital
98	Reynolds ACH–Ft. Sill	Reynolds ACH	Ft. Sill	OK	Army	Large Hospital

Table G-1. Military Treatment Facilities Included in Intensity Analysis Sample (Continued)

DMIS ID	DMIS Facility Name	Facility Name	Installation Name	State	Service	Size Class
101	363rd Med Grp–Shaw	363rd Medical Group	Shaw AFB	SC	Air Force	Small Hospital
104	NH Beaufort	NH Beaufort	Beaufort	SC	Navy	Small Hospital
105	Moncrief ACH–Ft. Jackson	Moncrief ACH	Ft. Jackson	SC	Army	Large Hospital
106	28th Med Grp–Ellsworth	28th Medical Group	Ellsworth AFB	SD	Air Force	Small Hospital
107	NH Millington	NH Millington	Millington	TN	Navy	Small Hospital
108	William Beaumont AMC–Ft. Bliss	William Beaumont AMC	Ft. Bliss	TX	Army	Medical Center
109	Brooke AMC–Ft. Sam Houston	Brooke AMC	Ft. Sam Houston	TX	Army	Medical Center
110	Darnall ACH–Ft. Hood	Darnall ACH	Ft. Hood	TX	Army	Large Hospital
112	96th Med Grp–Dyess	96th Medical Group	Dyess AFB	TX	Air Force	Small Hospital
113	396th Med Grp–Sheppard	396th Medical Group	Sheppard AFB	TX	Air Force	Large Hospital
114	47th Med Squad–Laughlin	47th Medical Squadron	Laughlin AFB	TX	Air Force	Small Hospital
117	Wilford Hall Med Ctr–Lackland	Wilford Hall USAF Med Ctr	Lackland AFB	TX	Air Force	Medical Center
118	NH Corpus Christi	NH Corpus Christi	Corpus Christi	TX	Navy	Small Hospital
119	649th Med Grp–Hill	649th Medical Group	Hill AFB	UT	Air Force	Small Hospital
122	Kenner ACH–Ft. Lee	Kenner ACH	Ft. Lee	VA	Army	Small Hospital
123	Dewitt ACH–Ft. Belvoir	Dewitt ACH	Ft. Belvoir	VA	Army	Small Hospital
125	Madigan AMC–Ft. Lewis	Madigan AMC	Ft. Lewis	WA	Army	Medical Center
126	NH Bremerton	NH Bremerton	Bremerton	WA	Navy	Large Hospital
127	NH Oak Harbor	NH Oak Harbor	Oak Harbor	WA	Navy	Small Hospital
128	92nd Med Grp–Fairchild	92nd Medical Group	Fairchild AFB	WA	Air Force	Small Hospital
129	90th Med Grp–F.E. Warren	90th Medical Group	F.E. Warren AFB	WY	Air Force	Small Hospital

APPENDIX H: SUMMARY STATISTICS FOR THE INTENSITY ANALYSIS SAMPLE

APPENDIX H: SUMMARY STATISTICS FOR THE INTENSITY ANALYSIS SAMPLE

This appendix provides summary statistics for the 75 MTFs included in the intensity analysis sample.

Table H-1. Medical Center Summary Statistics

Variable	Fiscal year	Sample size	Mean	Standard deviation	Minimum	Maximum
Deflated cost	1989	11	58,353,997	31,569,068	19,822,958	114,730,879
	1990	11	59,148,361	30,054,380	19,800,826	115,240,342
	1991	11	67,140,474	36,075,499	20,115,694	126,220,091
	1992	11	72,781,410	40,522,812	23,051,455	142,840,660
	1993	11	72,427,001	46,899,607	20,641,549	175,644,884
	1994	11	69,180,562	40,153,378	20,761,520	139,892,661
	1995	11	69,232,016	40,634,524	20,922,687	141,867,449
Dispositions	1989	11	16,720	6,522	6,631	24,693
	1990	11	16,550	6,777	7,145	26,220
	1991	11	16,068	6,412	7,213	25,970
	1992	11	16,705	6,882	7,381	27,760
	1993	11	16,020	6,687	7,009	26,235
	1994	11	15,279	6,509	6,628	25,792
	1995	11	15,444	6,917	5,842	26,434
Case-mix index	1989	11	1.0607	0.1982	0.8377	1.3864
	1990	11	1.1256	0.1864	0.9178	1.4628
	1991	11	1.0330	0.1774	0.8107	1.2747
	1992	11	1.1006	0.1918	0.8750	1.3922
	1993	11	1.0963	0.1800	0.8499	1.3570
	1994	11	1.1333	0.2000	0.8486	1.4129
	1995	11	1.1449	0.2273	0.8362	1.5688
Case-mix adjusted dispositions	1989	11	18,293	9,257	6,058	33,207
	1990	11	19,339	10,242	6,558	38,036
	1991	11	17,307	9,266	6,091	33,103
	1992	11	19,242	10,592	6,458	38,315
	1993	11	18,415	10,075	5,957	35,601
	1994	11	18,163	10,037	5,625	35,122
	1995	11	18,782	11,326	5,047	41,243

Table H-2. Large Community Hospital Summary Statistics

Variable	Fiscal year	Sample size	Mean	Standard deviation	Minimum	Maximum
Deflated cost	1989	17	16,926,543	4,684,827	8,642,620	26,007,971
	1990	17	17,392,870	5,048,701	8,738,994	26,215,226
	1991	17	17,011,388	5,686,414	7,848,370	28,001,103
	1992	17	17,252,821	5,338,564	8,192,665	28,758,868
	1993	17	17,417,745	5,952,757	8,750,271	29,776,978
	1994	17	17,620,306	6,346,104	8,013,189	32,698,983
	1995	17	17,591,217	6,589,792	8,627,402	34,451,692
Dispositions	1989	17	8,974	3,838	3,718	18,398
	1990	17	8,985	4,075	3,424	18,161
	1991	17	8,398	3,840	3,156	17,146
	1992	17	8,472	3,968	3,075	19,329
	1993	17	8,186	3,877	3,298	19,311
	1994	17	7,870	3,897	2,933	17,586
	1995	17	7,681	4,090	2,833	18,974
Case-mix index	1989	17	0.7147	0.0583	0.6194	0.8873
	1990	17	0.7464	0.0665	0.6326	0.8497
	1991	17	0.6994	0.0609	0.6109	0.8183
	1992	17	0.7114	0.0621	0.6156	0.8566
	1993	17	0.7064	0.0774	0.6121	0.9519
	1994	17	0.7202	0.0645	0.6260	0.8981
	1995	17	0.7202	0.0647	0.6179	0.8789
Case-mix adjusted dispositions	1989	17	6,334	2,486	2,845	11,675
	1990	17	6,606	2,780	2,851	12,790
	1991	17	5,797	2,556	2,461	11,967
	1992	17	5,931	2,642	2,331	13,414
	1993	17	5,646	2,447	2,868	12,886
	1994	17	5,553	2,588	2,634	12,833
	1995	17	5,428	2,773	2,490	13,684

Table H-3. Small Community Hospital Summary Statistics

Variable	Fiscal year	Sample size	Mean	Standard deviation	Minimum	Maximum
Deflated cost	1989	47	5,899,048	3,195,479	1,845,387	14,709,459
	1990	47	5,744,380	2,861,825	1,749,708	14,503,823
	1991	47	5,817,468	2,966,001	1,554,750	14,173,878
	1992	47	6,148,613	3,212,650	1,605,730	16,583,883
	1993	47	6,294,573	3,223,018	1,689,573	15,639,831
	1994	47	6,322,792	3,370,469	1,461,956	16,119,066
	1995	47	6,117,821	3,477,824	1,514,953	17,386,326
Dispositions	1989	47	3,026	1,615	545	7,715
	1990	47	2,909	1,582	611	7,801
	1991	47	2,613	1,528	467	7,541
	1992	47	2,682	1,573	464	7,629
	1993	47	2,623	1,532	454	7,127
	1994	47	2,430	1,574	295	7,443
	1995	47	2,256	1,452	204	6,744
Case-mix index	1989	47	0.6444	0.0795	0.4998	0.8072
	1990	47	0.6620	0.0900	0.5014	0.8629
	1991	47	0.6318	0.0808	0.4874	0.8060
	1992	47	0.6523	0.0874	0.4569	0.8246
	1993	47	0.6543	0.0822	0.4979	0.8180
	1994	47	0.6910	0.1007	0.5072	0.9231
	1995	47	0.7105	0.1362	0.4949	1.1978
Case-mix adjusted dispositions	1989	47	1,967	1,107	373	4,902
	1990	47	1,934	1,088	424	5,105
	1991	47	1,654	985	332	4,582
	1992	47	1,754	1,040	361	4,775
	1993	47	1,734	1,043	333	4,506
	1994	47	1,677	1,087	232	4,698
	1995	47	1,578	1,001	158	4,491

APPENDIX I: REGRESSION ANALYSIS OF CASE-MIX INDEX

APPENDIX I: REGRESSION ANALYSIS OF CASE-MIX INDEX

Table I-1 gives the mean case-mix index and age/sex composition of discharged patients at the 73 MTFs in the sample. Table I-2 gives the regression equations, by fiscal year, of case-mix index against the age/sex composition of discharged patients. Each column of Table I-2 contains the regression equation for one particular fiscal year. Note that two MTFs, though included in the intensity analysis, were excluded from the case-mix regressions because data on age/sex shares were missing for at least on fiscal year: 554th Medical Group, Nellis AFB (DMIS ID 79), and Naval Hospital Millington (DMIS ID 107).

Table I-1. Mean Case-Mix Index and Age/Sex Composition of Discharged Patients

	Fiscal Year				
	FY 1990	FY 1991	FY 1992	FY 1993	FY 1994
Case-mix index	0.8742	0.8215	0.8625	0.8588	0.8887
Age/sex group					
Females age 0-17	9.95	10.52	10.09	10.01	10.04
Females age 18-44	31.25	30.74	30.73	30.02	29.54
Females age 45-64	7.42	7.30	7.98	8.41	8.65
Females age 65+	3.59	3.76	4.11	4.29	4.55
Males age 0-17	11.59	12.35	11.88	11.79	11.68
Males age 18-44	23.17	22.25	21.10	20.90	20.97
Males age 45-64	7.93	7.90	8.51	8.68	8.65
Males age 65+	5.11	5.18	5.61	5.90	5.93
Sample size	73	73	73	73	73

Note: Table gives 100 × average proportion in each age/sex cell.

Table I-2. Regressions of Case-Mix Index Against Age/Sex Composition of Discharged Patients

	Fiscal Year				
Age/sex group	FY 1990	FY 1991	FY 1992	FY 1993	FY 1994
Females age 0-17	5.1566	3.6325	0.8972	1.1199	-0.7737
	(2.70)	(2.38)	(0.57)	(0.76)	(-0.46)
Females age 18-44	0.1437	0.2318	0.4730	0.2423	0.3902
	(0.59)	(1.02)	(1.94)	(0.76)	(0.99)
Females age 45-64	-0.4125	-0.3241	-0.7242	0.1485	-0.8945
	(-0.37)	(-0.31)	(-0.80)	(0.16)	(-0.76)
Females age 65+	5.5533	5.0937	5.1451	7.3286	6.2699
	(2.85)	(3.00)	(3.43)	(4.51)	(2.74)
Males age 0-17	-2.9002	-1.8516	0.1814	0.5235	1.9185
	(-1.78)	(-1.43)	(0.14)	(0.45)	(1.40)
Males age 18-44	0.7146	0.6409	0.6217	0.6448	0.6166
	(4.69)	(4.18)	(3.69)	(3.43)	(2.62)
Males age 45-64	1.5180	1.5575	0.9927	0.3419	1.6420
	(1.23)	(1.37)	(0.91)	(0.33)	(1.21)
Males age 65+	1.4980	1.0015	1.9217	-0.0827	0.4068
	(1.04)	(0.77)	(1.68)	(-0.07)	(0.25)
Sample size	73	73	73	73	73
R-squared	0.980	0.982	0.981	0.983	0.978

Note: Values in parentheses are t–statistics.

APPENDIX J: INTENSITY ESTIMATES BY FISCAL YEAR AND MTF

APPENDIX J: INTENSITY ESTIMATES BY FISCAL YEAR AND MTF

This appendix presents three sets of intensity estimates. Table J-1 gives the logarithmic change in cost per discharge, where cost in each year is first deflated by the HCFA hospital input-price index. These values equivalently may be regarded as the logarithmic change in cost per discharge, minus the logarithmic change in the HFCA index.

Table J-2 begins with cost per RWP rather than cost per discharge. The values also may be obtained from those in Table J-1 by subtracting the logarithmic change in the case-mix index.

Finally, the values in Table J-3 may be obtained from those in Table J-2 by subtracting the demographic adjustment factor of 0.05.

The MTFs are listed in all three tables in ascending order based upon the FY 1989/FY 1990 values in Table J-1. Note that we have not identified the MTFs by either facility name or DMIS ID. Although we have reasonable confidence in the weighted averages that are reported in the main text, we have less confidence in the individual MTF estimates. We report them here only to provides a sense of the dispersion in the individual estimates.

Table J-1. Price-Adjusted Log Change

Size Class	FY89/90	FY90/91	FY91/92	FY92/93	FY93/94	FY94/95
Small Hospital	-0.3341	0.2770	-0.0433	0.2120	-0.0879	0.0305
Small Hospital	-0.2103	0.1507	0.0387	0.0726	0.3406	0.3503
Small Hospital	-0.1898	0.4459	-0.0703	-0.3177	0.3385	0.2717
Small Hospital	-0.1361	0.0846	0.2636	0.1337	0.1642	-0.3749
Small Hospital	-0.1218	-0.2736	0.1378	0.3046	0.1013	0.1352
Small Hospital	-0.1171	0.0391	0.0745	-0.1567	0.2985	0.5122
Small Hospital	-0.1092	0.0005	-0.3500	0.0380	0.1309	-0.1497
Small Hospital	-0.0957	0.1401	-0.0427	-0.0313	-0.0131	0.4064
Small Hospital	-0.0762	0.2001	-0.0559	0.0470	0.3604	0.0641
Small Hospital	-0.0617	0.0427	0.1002	0.2253	0.3121	-0.2218
Small Hospital	-0.0535	0.0552	-0.0891	0.4774	-0.0349	0.0642
Small Hospital	-0.0413	0.0513	0.0271	-0.1994	0.0408	0.1343
Small Hospital	-0.0338	0.0905	0.1773	0.1308	0.0551	-0.0599
Small Hospital	-0.0251	-0.0124	-0.0328	0.1329	-0.0075	-0.0433
Small Hospital	-0.0245	0.7848	0.2309	-0.3721	0.0926	0.1125
Small Hospital	-0.0133	0.0139	-0.0205	-0.0312	-0.0816	0.2270
Small Hospital	0.0033	0.0596	-0.0077	0.0935	0.0343	0.0152
Small Hospital	0.0070	-0.0210	-0.0432	0.1499	0.0286	0.1586
Small Hospital	0.0084	-0.0089	0.0982	0.1318	0.1149	0.0874
Small Hospital	0.0093	0.5823	0.0587	0.1772	0.0645	-0.0936
Small Hospital	0.0163	0.1268	0.1167	-0.1765	0.2965	0.0474
Small Hospital	0.0173	0.3490	-0.0215	-0.2825	0.1176	0.0536
Small Hospital	0.0184	-0.0256	-0.1124	0.5156	0.0748	-0.0735
Small Hospital	0.0221	0.0682	0.2212	0.0147	0.0775	0.1119
Small Hospital	0.0319	0.0823	0.3979	-0.1295	0.3916	-0.0066
Small Hospital	0.0322	0.3056	-0.0934	0.1299	0.0843	-0.1187
Small Hospital	0.0394	0.0397	0.1192	-0.3682	-0.5179	0.8296
Small Hospital	0.0564	0.1973	0.0365	-0.0474	0.3193	0.0365
Small Hospital	0.0564	0.0651	0.0785	0.0716	0.0596	0.1117
Small Hospital	0.0629	0.1299	-0.0437	0.0862	0.1948	-0.0876
Small Hospital	0.0779	-0.0013	-0.0906	0.3310	-0.1925	0.3039
Small Hospital	0.0798	-0.0814	0.4336	-0.2876	0.0561	-0.1097
Small Hospital	0.0829	0.2948	0.0085	-0.0310	0.2162	0.2369
Small Hospital	0.0908	0.2154	0.0455	0.3192	0.0555	0.2085
Small Hospital	0.1033	0.2955	0.0162	-0.0449	-0.1758	-0.0327
Small Hospital	0.1067	0.2543	0.0554	-0.1232	-0.0384	-0.1319
Small Hospital	0.1234	0.1801	0.1914	0.0184	0.1257	0.0216
Small Hospital	0.1299	0.0627	0.0091	0.0108	0.1065	0.4534
Small Hospital	0.1410	0.0849	-0.2322	0.0868	0.3480	0.0486
Small Hospital	0.1424	0.1224	-0.2542	0.2891	-0.0922	-0.5773
Small Hospital	0.1490	0.0432	0.0258	0.0915	0.2358	-0.1114
Small Hospital	0.1496	0.1033	0.1147	-0.0776	0.1756	-0.0408
Small Hospital	0.1558	0.0192	-0.0025	-0.0429	0.0785	0.0882
Small Hospital	0.1758	-0.1102	-0.1001	0.1392	0.0673	-0.1146
Small Hospital	0.2217	0.0608	0.1557	0.1124	-0.0389	-0.1194
Small Hospital	0.2569	0.2726	-0.1441	0.1696	0.0371	0.0471
Small Hospital	0.3886	0.0710	-0.0825	0.1369	0.1383	0.1709

Table J-1. Price-Adjusted Log Change (Continued)

Size Class	FY89/90	FY90/91	FY91/92	FY92/93	FY93/94	FY94/95
Medical Center	-0.1229	0.1516	0.0570	-0.0123	0.0602	-0.0202
Medical Center	-0.0777	0.0923	0.1402	0.2263	-0.1697	-0.0922
Medical Center	-0.0757	0.0063	0.1132	-0.0588	0.0618	0.1339
Medical Center	0.0299	0.0583	-0.0114	0.1440	0.0362	-0.2567
Medical Center	0.0330	0.2271	0.2320	-0.1652	-0.0286	0.0456
Medical Center	0.0397	0.7137	-0.1539	-0.0128	0.0373	0.0660
Medical Center	0.0414	0.1022	-0.0053	-0.0544	0.0598	0.0045
Medical Center	0.0590	-0.0061	0.0366	0.0665	0.0000	0.0149
Medical Center	0.1211	0.0520	-0.0218	-0.0183	0.0410	0.0069
Medical Center	0.1629	-0.0271	0.0900	-0.2730	0.2118	0.1954
Medical Center	0.1949	0.0323	-0.0254	0.1501	0.0415	-0.1088
Large Hospital	-0.4189	0.0223	-0.0015	0.0109	0.0162	0.0973
Large Hospital	-0.0588	0.0582	0.0677	0.2282	-0.0034	0.0941
Large Hospital	-0.0240	0.0626	-0.0539	0.1101	0.1551	-0.0775
Large Hospital	-0.0074	0.0790	0.0200	0.1490	0.0390	-0.0071
Large Hospital	0.0035	0.1820	-0.0932	0.0357	0.1873	-0.0238
Large Hospital	0.0209	0.1137	0.0508	0.0089	-0.0482	0.1111
Large Hospital	0.0225	0.0451	0.0689	-0.1225	0.0085	0.0785
Large Hospital	0.0242	-0.0331	0.1227	-0.0104	0.1131	0.0714
Large Hospital	0.0267	-0.0632	-0.0085	0.0077	0.1516	-0.0007
Large Hospital	0.0327	-0.0143	0.2706	-0.1095	0.0918	0.0084
Large Hospital	0.0383	-0.0993	0.1294	-0.0215	0.3630	-0.1699
Large Hospital	0.0654	0.0351	-0.1273	0.1366	-0.0695	0.0610
Large Hospital	0.0767	0.0496	0.0689	0.0535	0.0319	0.0522
Large Hospital	0.0869	0.1586	-0.1727	0.0464	-0.0072	-0.0079
Large Hospital	0.1307	0.1490	-0.1661	0.0873	-0.0858	-0.0180
Large Hospital	0.3089	-0.1209	0.1741	-0.2142	-0.0850	0.2923
Large Hospital	0.3579	-0.0457	-0.1142	0.0821	0.0120	0.0543

Table J-2. Price and CMI-Adjusted Log Change

Size Class	FY89/90	FY90/91	FY91/92	FY92/93	FY93/94	FY94/95
Small Hospital	-0.3377	0.3018	-0.0674	0.1450	-0.0986	0.0102
Small Hospital	-0.2736	0.1759	-0.0507	0.1314	0.2690	0.3663
Small Hospital	-0.2207	0.4538	-0.1817	-0.2393	0.2256	0.0882
Small Hospital	-0.2028	0.2354	0.2736	0.1223	0.1604	-0.4267
Small Hospital	-0.1891	-0.2514	0.1460	0.2419	0.1481	0.1573
Small Hospital	-0.1991	0.1113	0.0838	-0.1176	0.2806	0.4720
Small Hospital	-0.1856	0.0179	-0.3775	0.0257	0.0854	-0.0163
Small Hospital	-0.1222	0.1334	-0.0122	-0.0255	-0.0381	0.4331
Small Hospital	-0.1919	0.3433	-0.0818	-0.0276	0.0817	-0.0837
Small Hospital	-0.0993	0.0049	0.0336	0.2519	0.1361	-0.2152
Small Hospital	-0.0444	0.1143	-0.1000	0.4866	-0.1631	0.0675
Small Hospital	0.0039	0.0578	0.0010	-0.2211	0.0034	0.1211
Small Hospital	-0.0988	0.1457	0.1247	0.1556	-0.0597	-0.0428
Small Hospital	-0.0545	0.0617	-0.0625	0.1008	0.0062	-0.0306
Small Hospital	0.0190	0.8100	0.2542	-0.4644	0.0358	0.0982
Small Hospital	-0.0510	0.0957	0.0037	-0.0967	-0.1625	0.1872
Small Hospital	-0.0303	0.1222	0.0070	0.1984	0.0124	0.0389
Small Hospital	0.0525	0.0256	-0.1008	0.1018	-0.0024	-0.0965
Small Hospital	0.0035	0.0168	0.1167	0.0774	0.1031	0.0601
Small Hospital	-0.0468	0.6372	0.0598	0.1359	0.1179	-0.0503
Small Hospital	-0.0353	0.1626	0.0766	-0.1409	0.2926	0.0048
Small Hospital	-0.0550	0.3401	-0.1053	-0.2366	0.0533	0.1418
Small Hospital	0.0126	0.0385	-0.2028	0.5356	0.0477	-0.5047
Small Hospital	0.0116	0.1049	0.1104	0.0088	-0.0087	0.1530
Small Hospital	0.0882	0.1734	0.2466	-0.1392	0.3458	-0.2133
Small Hospital	0.0967	0.2847	-0.1522	0.1742	0.0961	-0.0539
Small Hospital	0.1147	0.0681	0.1166	-0.5037	-0.4437	0.7104
Small Hospital	0.0139	0.3093	-0.0553	-0.0442	0.1732	0.0042
Small Hospital	0.0466	0.1210	-0.0048	0.0902	0.0244	0.1714
Small Hospital	0.0372	0.1390	0.0627	-0.0026	0.1792	-0.0630
Small Hospital	0.0495	0.0859	-0.0445	0.3190	-0.2060	0.2917
Small Hospital	0.0841	-0.1132	0.4109	-0.2363	0.0479	-0.1114
Small Hospital	0.0475	0.2874	-0.0327	0.0102	0.2015	0.1884
Small Hospital	0.1063	0.2448	-0.0260	0.2939	-0.0137	0.2015
Small Hospital	0.0349	0.1375	-0.0531	0.0144	-0.2649	-0.0735
Small Hospital	0.0745	·0.3783	0.0550	-0.0520	-0.0780	-0.2581
Small Hospital	0.0876	0.2164	0.2112	-0.0634	0.0940	0.0159
Small Hospital	0.1611	0.0478	-0.0580	0.0790	0.0951	0.3126
Small Hospital	0.0814	0.0242	-0.1972	0.0814	0.2612	0.0907
Small Hospital	0.1828	0.1658	-0.2787	0.2609	-0.1425	-0.5498
Small Hospital	-0.0081	0.3192	-0.0080	0.1456	0.0714	-0.0391
Small Hospital	0.0715	0.1716	0.0975	-0.0564	0.0801	-0.0515
Small Hospital	0.1327	0.0787	-0.1035	-0.0368	-0.0240	0.1599
Small Hospital	0.0773	-0.0085	-0.1342	0.0876	0.0381	-0.1161
Small Hospital	0.2295	0.1600	0.1252	0.0557	-0.0979	-0.0915
Small Hospital	0.2457	0.3897	-0.1527	0.1623	-0.0369	0.1712
Small Hospital	0.4052	0.1321	-0.1269	0.1417	0.0858	0.2155

Table J-2. Price and CMI-Adjusted Log Change (Continued)

Size Class	FY89/90	FY90/91	FY91/92	FY92/93	FY93/94	FY94/95
Medical Center	-0.1211	0.1954	-0.0270	0.0047	0.0567	0.0191
Medical Center	-0.1313	0.2300	0.0520	0.2602	-0.2184	-0.1969
Medical Center	-0.0804	0.0897	0.0776	-0.0297	0.0633	0.1160
Medical Center	-0.0022	0.1607	-0.0930	0.1057	-0.1129	-0.3020
Medical Center	-0.0005	0.3571	0.0757	-0.1899	-0.0573	0.0077
Medical Center	-0.0908	0.7907	-0.1729	-0.0516	0.0531	0.0521
Medical Center	-0.0066	0.1720	-0.0656	0.0175	0.0034	0.0168
Medical Center	0.0224	0.0502	-0.0056	0.0711	-0.0284	0.0227
Medical Center	0.0305	0.1742	-0.0799	0.0037	0.0487	0.0428
Medical Center	0.0638	0.0571	0.0515	-0.3084	0.2032	0.2121
Medical Center	0.0337	0.0829	-0.0578	0.1397	-0.0014	-0.0768
Large Hospital	-0.3970	0.1152	-0.0091	0.0166	-0.0247	0.1289
Large Hospital	-0.0608	0.1200	0.0383	0.2671	-0.0353	0.0590
Large Hospital	-0.1514	0.1588	-0.1359	0.1900	0.1656	-0.1312
Large Hospital	-0.0783	0.0914	0.1017	0.1602	0.0053	-0.0146
Large Hospital	-0.0365	0.2337	-0.0875	0.0749	0.0978	-0.0120
Large Hospital	-0.0003	0.1255	0.0300	-0.0018	-0.0179	0.0926
Large Hospital	0.0090	0.0397	0.0971	-0.1415	-0.0263	0.0910
Large Hospital	-0.0407	0.0654	0.1007	0.0153	0.0798	0.0727
Large Hospital	-0.1157	0.1685	-0.0458	0.0590	0.1072	0.0066
Large Hospital	0.0455	-0.0112	0.2667	-0.0696	0.0352	0.0129
Large Hospital	0.0406	-0.0334	0.0451	-0.0316	0.3788	-0.1702
Large Hospital	0.1319	0.2052	-0.1941	0.1372	-0.0739	0.0425
Large Hospital	0.0910	0.1344	0.0710	0.0572	-0.0316	0.0523
Large Hospital	-0.0083	0.1462	-0.1042	0.0422	-0.0350	0.0228
Large Hospital	0.0963	0.1797	-0.1793	0.1063	-0.0776	-0.0444
Large Hospital	0.1135	-0.0547	0.0998	-0.3197	-0.0268	0.3140
Large Hospital	0.3236	-0.0038	-0.1478	0.0621	-0.0022	0.0926

Table J-3. Price and Partially CMI-Adjusted Log Change

Size Class	FY89/90	FY90/91	FY91/92	FY92/93	FY93/94	FY94/95
Small Hospital	-0.3427	0.2968	-0.0724	0.1400	-0.1036	0.0052
Small Hospital	-0.2786	0.1709	-0.0557	0.1264	0.2640	0.3613
Small Hospital	-0.2257	0.4488	-0.1867	-0.2443	0.2206	0.0832
Small Hospital	-0.2078	0.2304	0.2686	0.1173	0.1554	-0.4317
Small Hospital	-0.1941	-0.2564	0.1410	0.2369	0.1431	0.1523
Small Hospital	-0.2041	0.1063	0.0788	-0.1226	0.2756	0.4670
Small Hospital	-0.1906	0.0129	-0.3825	0.0207	0.0804	-0.0213
Small Hospital	-0.1272	0.1284	-0.0172	-0.0305	-0.0431	0.4281
Small Hospital	-0.1969	0.3383	-0.0868	-0.0326	0.0767	-0.0887
Small Hospital	-0.1043	-0.0001	0.0286	0.2469	0.1311	-0.2202
Small Hospital	-0.0494	0.1093	-0.1050	0.4816	-0.1681	0.0625
Small Hospital	-0.0011	0.0528	-0.0040	-0.2261	-0.0016	0.1161
Small Hospital	-0.1038	0.1407	0.1197	0.1506	-0.0647	-0.0478
Small Hospital	-0.0595	0.0567	-0.0675	0.0958	0.0012	-0.0356
Small Hospital	0.0140	0.8050	0.2492	-0.4694	0.0308	0.0932
Small Hospital	-0.0560	0.0907	-0.0013	-0.1017	-0.1675	0.1822
Small Hospital	-0.0353	0.1172	0.0020	0.1934	0.0074	0.0339
Small Hospital	0.0475	0.0206	-0.1058	0.0968	-0.0074	-0.1015
Small Hospital	-0.0015	0.0118	0.1117	0.0724	0.0981	0.0551
Small Hospital	-0.0518	0.6322	0.0548	0.1309	0.1129	-0.0553
Small Hospital	-0.0403	0.1576	0.0716	-0.1459	0.2876	-0.0002
Small Hospital	-0.0600	0.3351	-0.1103	-0.2416	0.0483	0.1368
Small Hospital	0.0076	0.0335	-0.2078	0.5306	0.0427	-0.5097
Small Hospital	0.0066	0.0999	0.1054	0.0038	-0.0137	0.1480
Small Hospital	0.0832	0.1684	0.2416	-0.1442	0.3408	-0.2183
Small Hospital	0.0917	0.2797	-0.1572	0.1692	0.0911	-0.0589
Small Hospital	0.1097	0.0631	0.1116	-0.5087	-0.4487	0.7054
Small Hospital	0.0089	0.3043	-0.0603	-0.0492	0.1682	-0.0008
Small Hospital	0.0416	0.1160	-0.0098	0.0852	0.0194	0.1664
Small Hospital	0.0322	0.1340	0.0577	-0.0076	0.1742	-0.0680
Small Hospital	0.0445	0.0809	-0.0495	0.3140	-0.2110	0.2867
Small Hospital	0.0791	-0.1182	0.4059	-0.2413	0.0429	-0.1164
Small Hospital	0.0425	0.2824	-0.0377	0.0052	0.1965	0.1834
Small Hospital	0.1013	0.2398	-0.0310	0.2889	-0.0187	0.1965
Small Hospital	0.0299	0.1325	-0.0581	0.0094	-0.2699	-0.0785
Small Hospital	0.0695	0.3733	0.0500	-0.0570	-0.0830	-0.2631
Small Hospital	0.0826	0.2114	0.2062	-0.0684	0.0890	0.0109
Small Hospital	0.1561	0.0428	-0.0630	0.0740	0.0901	0.3076
Small Hospital	0.0764	0.0192	-0.2022	0.0764	0.2562	0.0857
Small Hospital	0.1778	0.1608	-0.2837	0.2559	-0.1475	-0.5548
Small Hospital	-0.0131	0.3142	-0.0130	0.1406	0.0664	-0.0441
Small Hospital	0.0665	0.1666	0.0925	-0.0614	0.0751	-0.0565
Small Hospital	0.1277	0.0737	-0.1085	-0.0418	-0.0290	0.1549
Small Hospital	0.0723	-0.0135	-0.1392	0.0826	0.0331	-0.1211
Small Hospital	0.2245	0.1550	0.1202	0.0507	-0.1029	-0.0965
Small Hospital	0.2407	0.3847	-0.1577	0.1573	-0.0419	0.1662
Small Hospital	0.4002	0.1271	-0.1319	0.1367	0.0808	0.2105

Table J-3 Price and Partially CMI-Adjusted Log Change (Continued)

Size Class	FY89/90	FY90/91	FY91/92	FY92/93	FY93/94	FY94/95
Medical Center	-0.1261	0.1904	-0.0320	-0.0003	0.0517	0.0141
Medical Center	-0.1363	0.2250	0.0470	0.2552	-0.2234	-0.2019
Medical Center	-0.0854	0.0847	0.0726	-0.0347	0.0583	0.1110
Medical Center	-0.0072	0.1557	-0.0980	0.1007	-0.1179	-0.3070
Medical Center	-0.0055	0.3521	0.0707	-0.1949	-0.0623	0.0027
Medical Center	-0.0958	0.7857	-0.1779	-0.0566	0.0481	0.0471
Medical Center	-0.0116	0.1670	-0.0706	0.0125	-0.0016	0.0118
Medical Center	0.0174	0.0452	-0.0106	0.0661	-0.0334	0.0177
Medical Center	0.0255	0.1692	-0.0849	-0.0013	0.0437	0.0378
Medical Center	0.0588	0.0521	0.0465	-0.3134	0.1982	0.2071
Medical Center	0.0287	0.0779	-0.0628	0.1347	-0.0064	-0.0818
Large Hospital	-0.4020	0.1102	-0.0141	0.0116	-0.0297	0.1239
Large Hospital	-0.0658	0.1150	0.0333	0.2621	-0.0403	0.0540
Large Hospital	-0.1564	0.1538	-0.1409	0.1850	0.1606	-0.1362
Large Hospital	-0.0833	0.0864	0.0967	0.1552	0.0003	-0.0196
Large Hospital	-0.0415	0.2287	-0.0925	0.0699	0.0928	-0.0170
Large Hospital	-0.0053	0.1205	0.0250	-0.0068	-0.0229	0.0876
Large Hospital	0.0040	0.0347	0.0921	-0.1465	-0.0313	0.0860
Large Hospital	-0.0457	0.0604	0.0957	0.0103	0.0748	0.0677
Large Hospital	-0.1207	0.1635	-0.0508	0.0540	0.1022	0.0016
Large Hospital	0.0405	-0.0162	0.2617	-0.0746	0.0302	0.0079
Large Hospital	0.0356	-0.0384	0.0401	-0.0366	0.3738	-0.1752
Large Hospital	0.1269	0.2002	-0.1991	0.1322	-0.0789	0.0375
Large Hospital	0.0860	0.1294	0.0660	0.0522	-0.0366	0.0473
Large Hospital	-0.0133	0.1412	-0.1092	0.0372	-0.0400	0.0178
Large Hospital	0.0913	0.1747	-0.1843	0.1013	-0.0826	-0.0494
Large Hospital	0.1085	-0.0597	0.0948	-0.3247	-0.0318	0.3090
Large Hospital	0.3186	-0.0088	-0.1528	0.0571	-0.0072	0.0876

APPENDIX K: ABBREVIATIONS

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ACH	Army Community Hospital
ADS	Ambulatory Data System
AFB	Air Force Base
AFIP	Armed Forces Institute of Pathology
AHA	American Hospital Association
AHE	Average Hourly Earnings
AMC	Army Medical Center
AMORD	Advanced Mission Oriented Resource Display
BLS	Bureau of Labor Statistics
BPA	Bid-Price Adjustment
BRAC	Base Realignment and Closure
CAM	Catchment Area Management
CEIS	Corporate Executive Information System
CHAMPUS	Civilian Health and Medical Program of the Uniformed Services
CHER	Center for Health Economics Research
CMI	Case-Mix Index
COLI	Cost-of-Living Index
CONUS	continental United States
CPI	Consumer Price Index
CPI–M	Consumer Price Index–Medical
CPI–U	Consumer Price Index–Urban Consumers
CRI	CHAMPUS Reform Initiative
DBOF	Defense Business Operations Fund
DCP	Data Collection Period
DFAS	Defense Financial and Accounting Service
DFSC	Defense Fuel Supply Center
DHP	Defense Health Program
DLA	Defense Logistics Agency

DMFO	Defense Medical Facilities Office
DMIS	Defense Medical Information System
DMPA	Defense Medical Program Activity
DMSSC	Defense Medical Systems Support Center
DoD	Department of Defense
DRG	Diagnosis Related Group
DRI	Data Resources, Inc
ECI	Employment Cost Index
FFS	Fee-for-Service
FTE	Full-Time Equivalent
FY	Fiscal Year
FYDP	Future Years Defense Program
GDP	Gross Domestic Product
GME	Graduate Medical Education
GSA	General Services Administration
HCFA	Health Care Financing Administration
HMO	Health Maintenance Organization
I&T	Intensity and Technology
ICA	Independent Cost Analysis
IDA	Institute for Defense Analyses
JCS	Joint Chiefs of Staff
MAC	Military Airlift Command
MCS	Managed Care Support
MEI	Medicare Economic Index
MEPCOM	Medical Entrance Processing Command
MEPRS	Medical Expense and Performance Reporting System
MHSS	Military Health Services System
MilPers	Military Personnel
MSC	Military Sealift Command
MTF	Military Treatment Facility
MTMC	Military Traffic Management Command
NAS	Non-Availability Statement

NH	Naval Hospital
NHE	National Health Expenditures
NIH	National Institutes of Health
NNMC	National Naval Medical Center
O&M	Operations and Maintenance
OCHAMPUS	Office of the Civilian Health and Medical Program of the Uniformed Services
OCONUS	outside the continental United States
OSD	Office of the Secretary of Defense
OSE	Open System Environment
PA&E	Program Analysis and Evaluation
PCM	Primary Care Manager
PE	Program Element
POM	Program Objective Memorandum
PPI	Producer Price Index
PPS	Prospective Payment System
PRO	Peer Review Organization
ProPAC	Prospective Payment Assessment Commission
RAPS	Resource Analysis and Planning System
RCMAS	Retrospective Case-Mix Analysis System
RPMA	Real Property Maintenance Activity
RWP	Relative Weighted Product
S&TA	Scientific and Technological Advances
SIC	Standard Industrial Classification
SuperPRO	Super Peer Review Organization
TOA	Total Obligational Authority
TSO	TRICARE Support Office
UM	Utilization Management
USAF	United States Air Force
USTF	Uniformed Services Treatment Facility
USUHS	Uniformed Services University of the Health Sciences
VRI	Vector Research, Inc.

APPENDIX L: BIBLIOGRAPHY

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13. ABSTRACT ***(Maximum 200 words)***

The Defense Health Program (DHP) is appropriated funds to provide medical care to active-duty military personnel and their family members, military retirees and their family members, and other eligible beneficiaries. A variety of inflation indices are used in updating the DHP budget requirement. This paper evaluates the appropriateness of those indices, and identifies alternative indices that are theoretically superior to those currently in use. In fact, inflation is only one of several factors that determine annual updates to the DHP budget requirement. This paper also develops estimates of an intensity/technology factor, which drives additional funding growth over and above inflation, demographic, and other adjustments already applied under current DHP methodology. Finally, we estimate the impact on the DHP budget if the alternative inflation indices were applied and, simultaneously, the intensity/technology factor introduced.

14. SUBJECT TERMS
Cost Analysis; Medical Costs; Inflation Index; Price Index; Defense Health Program; Intensity and Technology; Budgeting

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